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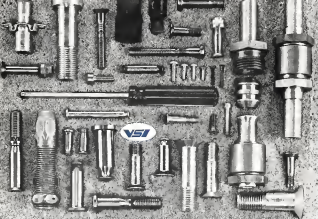
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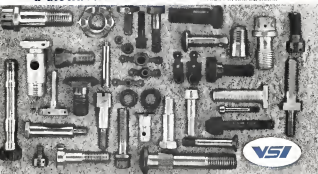
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BENDIX REPORTS ON ITS SUPPORT EXPERIENCE



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[These remarkably low gas and impurity levels can be most reliably

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■ Among first samples prepared from air-melted wire, 10 out of 25 failed at

the weld.]

■ Among similar samples prepared from the vacuum-melted wire of the

same grade, only two out of 25 bars failed at the weld.]

[Different alloys of Cannon-Muskegon vacuum-melted welding wire are

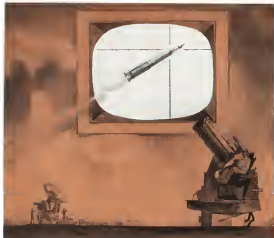
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operator sets cursor lines on this screen and the TV theodolite locks on target. From this point, target tracking and data transmission are automatic.

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Miniaturized cavity-type filter packs 4.2 square inches of filtering area into 1" x 1/2" element

Parolator develops thumb-nail size element to protect hydraulic control circuits on Army's Hawk Missile mobile launcher.

How small can you make an element that must filter a good hydraulic oil at 2500 psi at any temperature within a 215° range? Parolator's new miniature cavity-type hydraulic filter is the best answer to date. Here's why:

4.2 square inches of coarseness stainless steel wire cloth are packed into the miniature filter. This element, which weighs only seven grams, flows two gallons per minute of hydraulic oil, at temperatures ranging from -50° to +125° F. The element will withstand 4500 psi differential pressure without collapsing.

The element is made up of a total of 16 sheets of stainless steel wire, woven into wire cloth and assembled to extend filtration area. This element will remove 98% of all particles whose two smallest dimensions are larger than 10 microns, and 100% of all particles exceeding 25 microns or more.

The element at the top of the page shows you the complete filter assembly, ready for installation in the hydraulic control system. The overall length of the unit is 1 1/2", maximum overall diameter is 1". Total weight is slightly over a ounce. Designed as a cavity-type unit, the filter is installed simply by screwing it into the hydraulic system as the filter element intercepts oil flow. The element can be removed, cleaned and replaced without special tools.

The picture at right shows the mobile launching platform for the Hawk Missile. The compactness and mobility of the



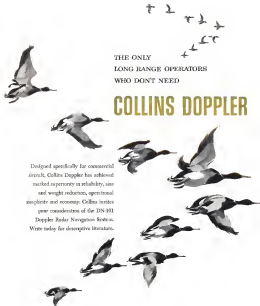
launcher, and the probability that it would be subjected to severe jolting, made it necessary to specify as small a filter as possible, and one that could be designed with the rest of the system for maximum simplicity and durability.

The Parolator engineers who developed this new miniature cavity-type filter are available now to design a filter to meet your specifications. Simply contact Parolator Products, Inc., Department 2006, Rahway, New Jersey.

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dead center

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Kelsey-Hayes is contributing substantially to the design, development and production of new thrust vector control systems for solid fuel propulsion.

For example Kelsey-Hayes, in a recent work program, designed and fabricated a movable nozzle control that passed static firing tests for one of the newest sophisticated missile systems.

The second nozzle control is just one of the latest developments by Kelsey-Hayes as a subcontractor of propulsion subsystems, flight component and high performance materials. Spearheading Kelsey-Hayes activities is the Advanced Design Group, a flexible team of experienced design specialists. Kelsey-Hayes Company, Detroit 32, Michigan.

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Model 2200 M has been extensively tested after Delphin block and general tests, plus ruggedness country hauling. It has been successfully tested at temperatures ranging from -42°F to 160°F . It has been subjected to salt spray, rain, fungus, sand and dust. Similar units are now in operational use by the military.



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rooms duplicate almost any condition of heat, cold, wet, wind, and contamination.

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By building strength upon strength in the area of space technology leadership, the knowledge and experience gained from Atlas, Thor, and Titan Ballistic Missile systems development is being applied to advanced Minuteman. For these programs, under the management of the Air Force Ballistic Missile Division, Space Technology Laboratories has led the direct responsibility for overall systems engineering and technical direction. At these facilities missile and related space programs go forward, STL continues to provide technical leadership and scientific direction.

In the capacity STL offers national opportunities for service work in the science and technology of space systems. To these scientists and engineers with capabilities in propulsion, electronics, thermodynamics, cryogenics, structures, aerodynamics, computer technology and other related fields and disciplines, STL now offers immediate opportunities. Please address your inquiries and/or resumes to:

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EDITORIAL

Defense Is Now a Key Issue

The Nixon-Rockefeller agreement on key planks of the Republican party's 1968 presidential platform has cemented national defense a place in the coming election campaign as one of the key issues. The Nixon-Rockefeller agreement resulted in a substantial strengthening of the Republican defense plank (see Congressional Editor Ford Hanson's detailed on-the-spot report from Chicago on page 28) although it did not emerge as strong as Governor Nelson Rockefeller's earlier position on the defense problem. This compromise is the direction of a stronger defense plank at Chicago indicates that the Republicans recognize they cannot stand as truly put on their record and must take a fresh and more vigorous approach to the increasingly crucial problem of our national defense posture.

It is now apparent that both political parties are acutely aware that national defense is a burning issue with the American people and that it is a problem that no public office seeker can safely ignore in the fall election campaign. In fact, it is pretty obvious now that the American voter's opinion of how either political party will handle the defense problem facing this country in its historic struggle with the Soviet Union will be an extremely important yardstick in the millions of decisions that will be made in the secrecy of the voting booths across the country on November 5.

It is a hopeful sign that both parties recognize in their platforms that there is no price ceiling on this country's security and at the same time are in agreement that more money is not necessarily a quick or effective solution but that far more efficient management of our defense resources is urgently required. Both parties also recognize in their platforms that the impact of technology has outstripped many of our traditional military approaches to the defense problem.

Emphasis on the Future

This provides a good base from which to generate an intelligent discussion of our future defense problems in the fall campaign. It will save little purpose to attempt to pin party labels on our major defense errors of the past year. There have been plenty under both banners. The ill-fated defense economy years of 1949 by the Truman Administration just before the Korean war began was just about as far off the beam as the present Administration's stubborn failure to recognize the growing challenge of Soviet military technology in jet aircraft, ballistic missiles and space technology during the mid 1950s.

Oddly enough, neither presidential candidate has identified himself strongly with the defense issue until recently. Senator Kennedy was conspicuous by his

absence in the great national defense debates of the past few years until he played into the missile gap controversy badly last fall. Vice President Nixon has several times sought an attempt to take a stronger position on defense issues in the post-Sputnik era but each time has been dragged back into silence by his opponent.

Candidates' Experience

Both Senator Johnson and Henry Cabot Lodge have had considerably more day-to-day practical experience with the realities of the Soviet threat and methods of combating it than their opponent on the party tickets. Senator Johnson in his leadership of the Senate and his work with the preparedness and space committees has taken a leading role in shaping the strong defense policies that have emerged from the Congress during the past few years. Ambassador Lodge in his role as permanent U.S. representative at the United Nations has done an outstanding job in grappling with the Soviets on the multitude of theory issues that regularly appear before that body. He also played an active role in the Armed Services Committee during his tenure in the Senate. It may be that because of the outstanding backgrounds of both vice presidential candidates in defense problems, this office may play a more important role in this area for the 1968 Administration.

Certainly the defense problems of this period are going to demand a heavy degree of concentration by the chief executive and his principal assistant if any degree of success is to be achieved toward their solution. This concentration will require a more thorough understanding of the modern technology that has revolutionized military science since the end of World War II and more frequent direct contacts with the military leaders who have operational responsibility as such key areas as Strategic Air Command, the joint commando overseas or in the direction of research and development efforts. A three-hour trip around Cape Canaveral or a few minutes at the wheel of a nuclear-powered submarine cannot be considered adequate training for a chief executive facing the defense problems of the future.

Both sides of candidates have an excellent opportunity to demonstrate to the voters of this nation their personal program and policies on the defense issue. They should provide the voters with the best possible base of comparison on which to make their judgments of which pair would do the better job of steering a sound and courageous course on the defense issue.

This is an encouraging and healthy prospect for the nation.

—Robert Hata



BURGOYNE IGNORES RECONNAISSANCE AND INVITES DISASTER

General "Gentleman" John Burgoyne was not one to fret over reconnaissance.

Saratoga, frequently called the turning point of the American Revolution, was the end product of a series of "no reconnaissance" battles that to Burgoyne's lifetime (and, supposedly, confidence) as he swung northward from Canada, the British commander rarely knew where or what was ahead. Sir John's British force, vital elements to Burgoyne's campaign, disintegrated when its sizable Indian contingent melted at news of a huge American counter force. Reconnaissance would have readily shown the Americans mustered a mere 1,000 men. Along his march, Burgoyne dispatched his grenadiers to reinforce a Hessian advance unit at Bennington — an attack, without adequate reconnaissance. The grenadiers did not discover until after they were decimated by a Colonial force that the Hessians had already been wiped out. Finally,

Burgoyne's overblown and weakened army, completely ignorant of enemy forces, surrendered at Saratoga.

Throughout the history of warfare, successful field commanders have based concerted decisions on proper reconnaissance. Burgoyne's ignored history and the lessons met for strategic and battlefield reconnaissance thus creating a series of fatally erroneous decisions and helping to assure the success of the American Revolution.

From the beginnings of communications as the face of the earth, reconnaissance has shaped history. Today C&I is especially in this area in helping shape history in the advantage of the Free World. Typical of C&I capabilities are: W.I.F., Visual Integrated Perceptual, data display system; K&D, the world's most sensitive aerial camera; S&D, the only electro-optical "available now" guidance system.



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WHO'S WHERE

In the Front Office

George Kennedy, a director, Douglas Aircraft Company, Inc., Santa Monica, Calif.; Joe Bergery is president of American Vision Corp.,
Frank E. DeLano, Jr., president, American Associates, Inc., Los Angeles, Calif.; vice president Robert L. Koo, now head of this firm.

Marion F. Sperry, a director and vice president, PerkinElmer, Inc., Boston, Mass.

George H. Noble, a director, Narda Systems Corp., Los Angeles, Calif.; Mr. Noble is president of Griggs Corp., a subsidiary of Underwood Corp.,
Joe Kamen, president, Portland Industries Corp., South Portland, Me.

Owen L. Jones, former Washington representative for Muhl Engineering and Muhl Electronics Co., Inc., now vice president at Boston Division, The William H. Rousey, vice president, marketing.

Edward H. Heermann, formerly vice president, Douglas Aircraft Co. (AW July 23, p. 31) executive vice president, Spacostat Electronics Co., Santa Monica, Calif.

Elde Auer and Kenneth J. Steynok, director, Sperry Corp., Dallas, Tex.; Mr. Auer is the company's vice president, while Mr. Steynok, vice president, remains following.

George D. Bofka, a vice president in research, Remington Co., Philadelphia, Pa.; Mr. Bofka continues as director of marketing.

R. C. Chapman, executive vice president and a director, Cincinnati Engineering & Research Co., El Monte, Calif.
Thomas B. Fuchtel, Executive-Charles D. Fuchtel, Department of Commerce.

Albert J. Winfield, III, vice president and general manager, Special Products Division, The Westinghouse Co., Cleveland.
James S. Strauss, vice president and general manager, Bell Electronics Inc., Long Island City, N. Y.; a Bell Co. subsidiary.

Frederic W. Davis, executive in the general staff as public relations, Bell Industries (parent Corp.), South Bend, Ind.
George Chiswell, executive in the president, The Rand Corp., Santa Monica, Calif.

Cal John R. Matthews, chief of Air Materiel Command, Department of Defense, Air Procurement Director; Col Robert E. Lawrence, chief of Military in chief of the Logistics, Liaison Division at ASAC Headquarters.

William E. Golan, general counsel and John H. Wenden, patent counsel, National Aeronautics and Space Administration's Marshall Space Flight Center, Huntsville.

Honors and Elections

Dr. Otto Biefers, distinguished scientist and currently a consultant to the Lawrence Radiation Laboratory, has received the Distinguished Public Service Award from the Department of Defense for "his exceptional sustained contributions to the country of the United States."

(Continued on page 90)

INDUSTRY OBSERVER

▶ Soviet scientists are working intensely on communications satellites, with primary emphasis on synchronous (stationary) space vehicles in 22,000 mi. geostationary orbits. Several plans to use a "circumflex reflector" to provide high-gain gain and precise use of lower power orbit. NASA's operational power satellite would. Soviet vehicles may consist of a web or net of dipole reflectors, oriented to catch signals from earth.

▶ Skin and underwater control crates for first three squadrons of Minuteman missiles will be completed by mid-July, but successful installations probably will not "commence" until current release (AW May 14, 1973, p. 20). Warhead installation for these squadrons costs approximately \$10 million for missiles and \$10 million for missiles and cover.

▶ Vladimir I. Voznesenskiy's sophisticated money system will include a vacuum system providing almost complete coverage of the globe, electrostatic type substitution to permit higher resolution studies of hurricanes, etc.; high resolution television with 5 sec. high resolution scenes for night cloud cover, 30 mi. medium resolution scenes for radiation measurements, and 300 mi. low resolution heat balance scenes. It also will measure the solar constant and solar ultraviolet and particle radiation. Launch is expected late next year.

▶ Selection of a contractor for the GR93 test set adapter for the USAF Douglas Aircraft Co.-designed tactical aircraft is underway. Martin Marietta and Lockheed appear to be favored among the 19 firms that submitted bids to Northrop's Northrup Division, subcontractor to Douglas for guidance.

▶ Orbital radio reflector consisting of thousands of tiny needle needles is being studied by Massachusetts Institute of Technology, under Defense Department sponsorship. Needles would be set out in periods as exclusively large, efficient reflecting surfaces. They would be designed to prevent no collisions based on no interference for radio astronomy as space radio experiments. Trials are expected within a year in a "pygmy" payload.

▶ USAF has been keen to initiate a program for development of a satellite microwave vehicle, including experimental launches, to Defense Department. Goal is to develop close-approach techniques. These designs of superior satellites carrying television, infrared cameras and/or nuclear solution systems, as laboratory satellites with 100 mph capability. Details are being worked out, Defense believes. USAF has pushed the idea since the Soviet S&I Division and interception project.

▶ Landing equipment of Nike Zeus anti-ICBM missiles for joint defense of a free world area is giving increased support in Defense Department. USAF's proposal for a lower cost joint defense anti-ICBM, known as Project Cheaper, has little support because of efforts and funds already put into Zeus program.

▶ Possible collision hazard posed by on-orbit into the atmosphere of a nuclear reactor from a satellite's power system will be investigated by Ares under a contract from Wright Air Development Division. Ares hopes to develop techniques for predicting conditions of such a event.

▶ Defense Department solicited for implementation of USAF's program for earth, mobile ICBMs (AW July 18, p. 36) will depend on a "technical" control system to permit firing by carrier ships from any of thousands of track interceptors. Second phase of the study, which encompasses operation of such missiles in 1978, is expected to receive serious consideration this early phase, which would have mature study in 1983, coinciding with Minuteman's availability.

▶ Image enhancement equipment being developed for Army by FMA, Inc., has identification of water fields in proposed for use in space to identify and interpret, by direct scope-viewing, physical phenomena normally undetectable on photographic or video display. Systems, expected to have a 3,000-line resolution capability, should give better definition and speed the examination process.

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The Defense Issue

The argument of defense is so obvious now that was obvious last week in Republican jockeying over the platform. Presidential winner Richard Nixon evidently wasn't unseating stronger than the Eisenhower defense stand to run on. He got a platform sized broad enough to give him considerable leeway during the campaign.

The only question now is how much the defense effort will be increased when a new Administration takes over in January. Both Democrats and Republicans are now on record for a bigger effort, although the Democrats take a stronger stand.

Nixon went a long way toward adopting the defense philosophy of New York Governor Nelson Rockefeller, which is very similar to the Democratic position. Cowardice never managed to tone the defense plank down much, but it enough to bring a change in the magnitude of the defense effort. Apparently Nixon sensed a strong public interest in the issue and didn't want to be tied to a potentially unpopular standstill defense.

President Eisenhower approved the defense plank in the Republican platform, but he made it clear he still stands on his sound. He told the convention there is room for program changes to meet changing conditions, but basically he concentrated on defending the defense policies he has followed during his years in the White House.

Top Defense Department scientists got a progress report on the Project Defender heliolic missile defense research program last week. The Advanced Research Projects Agency project reportedly has produced considerable new knowledge on the radar and infrared radiation signatures of heliolic missiles. This kind of data is fundamental to any successful missile detection and defense system.

New information is valuable, but nothing saying on a technological basis/through an ICNIRL disease concepts.

Mail Airlift Threat

Postmaster: General Author Swansonfield tilted airline officials to Chicago last week for a conference on the Cessna/Boeing Bill. The legislation would prohibit entry of any used and not carrying on animal stamp. The House approved it, but it is expected to hit neither deadline in the Senate.

Somehow he influenced whatever efforts by the unions that went into pushing the bill through the House and described protesters the real experts on applying to the Senate. It was apparent that unions would have to mount a counteroffensive to the Bush drive. But, again, wrong.

Seaworth also told the editors that the Post Office Department is willing to accept Civil Aeronautics Board orders for surface mail service. He said the Post Office is not looking for authority to negotiate rates with individual carriers.

Negotiations on a nuclear test ban took a small step forward last week when the Soviet Union offered to permit these inspections a year in its territory. These inspections could be made by international teams investigating possible violations of a nuclear test ban treaty.

This inspection provision is too limited to win acceptance by the U. S. and Britain. But it is regarded as a sign of Soviet interest in serious negotiations after dodging the issue of definite inspection quotas since April, 1948.

Study of Aerosolization

House Government Military Operations Subcommittee is studying the organization and role of Aerospace Corp. Last year this group, headed by Rep. Chet Holifield, objected to Space Technology Laboratories Inc. with Thompson Research Worldwide. These objections led to replacement of STL by Aerospace Corp. in Air Force Ballistic Missile Division's technical arm.

Cold war tensions were evident in reports of Communist soldiers around Berlin and over U.S. bases in Spain. Both White House and State Department downplayed stories that the U.S. had intelligence reports warning of a significant increase in Soviet military strength around Berlin and of plans to move against West Berlin within 30 days.

Air Force denied a report that Czechoslovakian B-15 transport transports lying on Cowley in Cienega were chased away from U.S. boats by Spanish and U.S. interceptors. Czech transports are reported to have wandered from prescribed routes several times in attempts to fly over U.S. bases in Spain and Mexico.

Strategic value of the growing Soviet fleet of long-range nuclear submarines was demonstrated when three D-11s flew 6,500 mi. to the Congo, each carrying close to six tons of food. The D-11s also carried Chinese troops to the Congo to join the United Nations force.

—Wahlberechtigte: 8447

AMC Plans ICBM Site Activation Force

Twelve regional commanders will be assigned to speed Atlas, Titan lines toward operational status.

Washington—Moving fast to implement its new responsibility in the ballistic missile program, Air Materiel Command will designate 12 senior Air Force commanders as site activation task force coordinators at the various Atlas and Titan deployment locations under construction across the country, to avoid obstacles and maintain speed in all phases of effort toward operational capability.

The task force commanders will report directly to Maj. Gen. Thomas F. Gentry, area commander of AMC's Ballistic Missile Center, Inglewood, Calif. With his new assignment starting a week old, Gen. Gentry already has briefed AMC staff on the projected detailed action BMC will take in its new responsibility.

Management responsibility for the ballistic missile site activation job was delegated to AMC after eight months of studies, reviews and deliberations by a team of about a dozen general officers from Air Research and Development Command, Air Materiel Command, Headquarters, USAF, headquarters at the Andrews Board. Headed by Gen. Samuel E. Anderson, AMC commander, the board considered the entire spectrum of program management for creating ballistic missile, and considered a potential for management of future weapon system programs.

Conclusions of the board, followed by deliberations by Headquarters, USAF, and subsequent management by Air Force Secretary Douglas M. Stange, resulted in assignment of ballistic missile development and site activation management responsibilities (AW July 25, p. 38). ARDC remains responsible for development of the missile weapon system, while AMC assumes responsibility for the activation phase, coordination of technical and technical engineering, and for technical coordination of the weapon system operational capability. Two other, continued control of the ICBM from work acceptance to point of "turning over the key" to Strategic Air Command and its Factors of ARDC's Ballistic Missile Division, with AMC's Ballistic Missile Center contributing in a supporting capacity. Now, from the point of base beginning—since the site activation phase is now assumed by ARDC—the remaining job is AMC's. That will include such site activation factors as construction, installation and checkout of the system, including turn-in of weapons inventory and the site as part of the ground support.

Under this approach, AMC will be responsible for base support to construction, will negotiate all base support agreements, and will have total responsibility for contractors' direction and performance. The AMC area site commanders will have no authority over all

Ballistic missile program otherwise, but for this new construction effort will have to be delegated specific discrete authority, as distinguished from a more conventional relationship with respect to Corps of Engineers' other field offices which have been involved with strict implementation of construction phases of the ICBM sites. It has in fact been these observations, and a recognition of construction problems encountered in the past will occur. Apparently the question was being given serious consideration at a Corps of Engineers general staff level meeting in Washington last week.

Since ballistic missile program observers have suggested that unit service factors and skills for authors may have been responsible for the difficulty in site activation responsibility, from ARDC to AMC, with the final decision being made in AMC's favor by USAF Headquarters. But observers also have pointed out that it is not so clear as a generalization, after evaluation, of what is considered a base AMC function. Possibility is that the decision for changes might have been accelerated by the delay in meeting last week, program activation, as pointed to be less than six months later, in the most active centers, at Offutt in St. Louis, Mo. and at the Air Force's Ballistic Missile Center, Inglewood, Calif. The new construction office will be 25 offices and 121 officers. Meanwhile 25 offices from Corps of Engineers have reported to military sites on base property duty, but to be followed shortly by 40 more officers who will be transferred from lower priority assignments to key jobs at missile construction sites.

Site activation management responsibility is currently delegated to ARDC in the state of the ballistic missile program was not considered unusual even in the face of the command's basic strength and development role. No one would expect a responsible role in this type of construction, with all at the construction of current missile equipment. Certainly no Air Force field project had ever involved such work under such conditions. Now that base construction that of itself has been moved ahead, along with work on the missile program, military observers feel that delegation of site activation responsibility to AMC is a natural progression in recognition of duties to which more advanced the talents of both AMC and ARDC. Even before the transfer of responsibility to AMC, base field work was being shifted in elements from both AMC and BMD, with responses that are expected being about six to one in favor

AMC Site Commanders

The 12 new task force commanders appointed by AMC to site activation responsibility include:

- Alto Site
Funchall AFB, Wash.—Col. Thomas S. Jeffrey, Jr.
Wallops AFB, N. M.—Col. Robert L. Bowerhough
Fulton AFB, Ky.—Col. William E. Ruck
Schilling AFB, Kan.—Col. Arthur W. Cookland
Davis AFB, Okla.—Col. Ernest L. Rains
Dyers AFB, Tenn.—Col. Hugh H. McInerney
Ft. Worth AFB, N. T.—Col. Col. W. T. Lane

- Valley Site
Lester AFB, Wash.—Col. Edward J. York
Barksdale AFB, La.—Col. William E. Smith
Ellsworth AFB, S. D.—Col. William E. Smith
Norfolk
Mendenhall AFB, Ala.—Col. Robert E. Boney
Lester AFB, Okla.—Col. James H. Thompson

of AMC. Types of AMC personnel assigned included plant representatives, representatives of the Air Materiel Command, Ballistic Missile Center personnel and others.

Some of the factors which have contributed to the delay in ICBM base program include:

- **Concurrent concept.** Basic philosophy of developing all elements of the ICBM weapon system in parallel, in addition to parallel development of the missile. When the specific task is defined and held, achievement of construction is relatively simple, but when development and development of the missile is required to keep abreast of an advancing state-of-the-art, concurrent is affected with involvement of what might be termed delay.
- **Complex construction.** Ballistic missile program observers noted that weapon test has not been entirely free "above the board" — that some parties have viewed the ICBM program with a "hassled in effect" attitude, contributing to delay.
- **Equipment deficiencies.** Deficiencies in ground support equipment, to be expected in new development programs, may well create a trend to delay, to remedy the condition has not always been available.
- **Interference.** New methods of quality control in concrete and steel construction have introduced delays in some instances. The changing conditions in-

posed by ICBM weapon system requirements have introduced rapid requirements in changing construction techniques.

• **Work stoppage.** This has been in excess of the labor allowance originally contemplated in the program. Past example of work stoppage occurred in the steel stage, which lasted over 100 days, and affected equipment delivery as well as construction delay. Since equipment normally transferred in the ground support category actually are construction category about work as the personnel loading facilities for the missile, which would be delayed through a shortage of material. A lack of interest in Ballistic Missile Division, Navy construction phases of the base site. In some instances, BMD had requested construction materials to the Corps of Engineers, but no prime contracts were transmitted as a result of communication.

Navy Asks Evolution Of 2,500 mi. Polaris

Washington—Navy will pass advance stage passed from current Polaris version to peak development of the 2,500 mi. A3 missile configuration.

First Polaris advanced launchers (AW July 25, p. 37) designated favorable comment at both Democratic and Republican conventions and Navy has been the entire Polaris program will be re-examined during the congressional session.

The A1 configuration first last launch has a 1,200 mi. range and will be the first operational version. Navy considers it an interim missile until the A3 version, with a range of 2,500 mi. A3 tactical missile is ready early in 1962.

Although the Polaris program is relatively small, the Navy has some money should be limited for concurrent development and development of the A1. Rear Adm. William F. Raborn, Polaris Project Director, last week said that A3 will be funded for development and ready for use in 1964.

Raborn said A3 would give Polaris submarines an effective operating area of nine million square miles, twice the area possible with the 1,200 mi. A1 missile. Evolution of Polaris to a 5,000 mi. range will result from adding fuel to the first stage engine, which will increase the length of the vehicle from 21 to approximately 31 ft. Larger missiles will create a trend toward larger missiles, materials weight increases and higher specific impulse in the two solid fuel engines.

Naval General Corp. said it already has received orders for second generation Polaris missiles and flight test launchers.

this year. Against and the A1 configuration release total energy of more than 100 million pounds/second.

Senior sources, Polaris launches, the Navy has awarded contracts totaling \$112.5 million for program components. Electric Boat Division of General Dynamics Corp. was a \$60.1 million contract to build two solid-fuel missile submarines, and Newport News Shipbuilding and Dry Dock Co. was given a \$12.9 million contract for one submarine. Northrop Northrup Division was awarded \$28 million contract for BMDHQ checkout system (AW July 25, p. 40) gyroscopes, periscopes and instrument systems.

As the missile system enters operational status, the Navy's Strategic Organization is reviewing the construction of the U. S. proposal that they accept Polaris as a missile energy source.

French interest in acquiring a second generation as an offensive nuclear weapon, but British support for out-of NATO Polaris program is expected of U. S. leads the British nuclear submarine program.

French interest apparently is cool because President Charles de Gaulle prefers to maintain in France the technical capabilities to develop complete weapons systems. France has established a \$1.1 billion, long range program to develop nuclear weapons and delivery systems (AW July 25, p. 10).

Titan II Propellant System Briefing Set

Air Force Ballistic Missile Division will hold a brief on the Titan II propellant system, which is being developed in England, Calif., on a new joint-venture program for construction of the Titan II propellant transfer system.

As defined by BMD, the Titan II propellant transfer system includes the transfer of propellant and the loading equipment project establish that connect to the missile and giving first will connect the missile equipment to the transfer system.

The system will be designed to handle the two usable propellant—structure of hydrogen and symmetrical dimethyl hydrazine fuels and nitrogen tetroxide oxidizer—that will be used in the Titan II.

Air Force will select all critical propellant transfer system components to prequalify for use. At the moment, most of the transfer system components in the following categories: valves, filters and strainers, gauges and meters, load cell systems, and instrumentation.

On Aug. 9, the Air Force will list the requirements for potential suppliers.

Contractor Conference

Washington—L. & Defense Secretary Thomas S. Gates Jr. called the last session of 49 contractors in the Air Force and Air Materiel Command's Ballistic Missile Division, with AMC's Ballistic Missile Center contributing in a supporting capacity. Now, from the point of base beginning—since the site activation phase is now assumed by ARDC—the remaining job is AMC's. That will include such site activation factors as construction, installation and checkout of the system, including turn-in of weapons inventory and the site as part of the ground support.

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SOVIET TU-16 bomber was photographed by USAF over the North Pacific. Noted for under wing for electronic reconnaissance equipment.

Soviet Veto Stops RB-47 Investigation

By David H. Hoffman

New York—A Soviet veto in the U. N. Security Council last week scuttled a U. S. resolution urging an impartial investigation of whether the USAF RB-47 shot down by the Russians on July 1 had actually penetrated Soviet airspace.

The Russian rejection of the proposal followed U. S. Ambassador Henry Cabot Lodge's revelation that Soviet Air Force Tu-16 bombers regularly were flying electronic reconnaissance missions along Alaska's western perimeter and had been "in peril."

One such flight, Lodge said, penetrated U. S. airspace 5 miles on off

St. Matthew Island in the Bering Sea. The aircraft presumably was a ferry mission to probe Alaska's air defense radar defenses.

In the same session of the Security Council last, the Soviet Union vetoed an Italian resolution that would have enabled the International Red Cross to make contact with two of the downed RB-47 crewmen now being held by the Russians on charges of espionage.

Nine of the 11 rescues represented in the Council followed due two weeks' notice. Only Poland acted with the USSR in a vote at 88th and 99th votes last Tuesday night.

Earlier, the same three states voted

down a Soviet resolution that sought to "condemn" the RB-47 flight as an "aggressive act," while "insisting" that the United States roll a halt to electronic reconnaissance missions.

During the three-day debate last, Lodge contended that the RB-47 was forced by a Soviet fighter to fly toward the Russian coast along a course shown at Russia's Komsomolsk.

Pressing in from the Arctic Ocean to the north, the fighter delayed the bomber's intended turn away from the coastline—a turn scheduled to take place 50 miles from the nearest Soviet territory, Lodge said. The flight of the bomber, apparently monitored by both the United States and Great Britain from the powerful NATO radar station at Vardø, Norway, brought the RB-47 to a point 30 mi. off the tip of the Komsomolsk.

"That is the closest it ever was to the territory of the Soviet Union," Lodge declared.

Russia had contended that the reconnaissance bomber was shot down 35.97 mi. north of Severny Nos Cape at 1901 Greenwich time while flying toward the city of Anchorage. But Lodge maintained that the plane disappeared at 1512 GMT, some 207 mi. from Severny Nos while flying in the opposite direction.

According to Lodge, the RB-47 was heavily outnumbered with a two-man crew that enabled a confident check of its position with respect to the Russian coast. Moreover, the crewmen were to "make a special check to ascertain themselves that the radio was functioning properly" before overflying an imaginary line 75 mi. out from Russian territory, Lodge said.

These provisions, Lodge told the Council, were taken because the crew knew that "the Soviet Union had on the



SOLID BLACK line of Russian flight map shows track of RB-47. First 'X' marks spot where Soviet claim plane was downed. Second 'X' indicates coordinates where plane disappeared from U. S. radar scope, while looped line to the north follows RB-47's actual track as by Russian flighters. Dashed line projects plane's intended course.

part land planes towards its frontier" (AW July 31, p. 10).

Contrasting the RB-47 flight with comparable Soviet flights of Alaska, Lodge cited two specific instances in which Russian reconnaissance bombers had approached the U. S. coast at

distances of less than 30 mi. Lodge made it clear that the Soviets were probing the northeastern air approaches to the United States from St. Petersburg's northern coast where one of the US DEW Line radar stations is located—in St. Matthew Island—about 750 mi. west of Anchorage.

On a large chart, one of five illustrations Lodge displayed before the Security Council, the delegate traced the course of the Soviet bomber Vega, which collected electronic data along the United States' eastern seaboard last April and May.

On Apr. 20, Lodge said, the Vega made its first appearance about 207 mi. southeast of Cape Cod, Mass., crossing an area in which the U. S. maintains substantial Group V-2 radar was testing the Polish satellite's electronic system. Disregarding instructions from U. S. naval vessels to stand clear, the Vega, according to Lodge, actually attempted to intercept a "limited test vehicle" dispatched earlier by the Group V-2's mission. The device made way recorded by the USS Niagara, a support ship, only after sharp maneuvering had created a collision with the Vega, Lodge said.

Contending that the penetration of maps was a "disputed matter," Andre V. Kerezhnev, a first deputy foreign minister of the Soviet Union, asked those two questions in Lodge.

Why, at the United States was aware

of the precise point at which the RB-47 disappeared, was the subsequent search not begun there? And why, if the plane was on a nocturnal mission, was it not directed to maintain radio contact?

The improper lack of such as from represented on the Council—Kerezhnev, Gorbunov, Arsenyev and Tsvetkov—previously returned those accepting at face value either the U. S. or Soviet version of the RB-47 incident. Many observers here felt that these four non-permanent members of the Council had been misled from citing directly with the United States in an handling of the U. S. incident last May.

Two of the four, Gorbunov and Arsenyev, recommended the formation of a commission, reconnaissance flights, even when such flights remained over international waters, as a means of increasing international tension. All, including the United Kingdom, France, Italy and Netherlands, agreed that the burden of proving whether the RB-47 flight actually was an "aggressive act," fell upon the United States and that the Soviet Union had failed "to make its case."

St. Pierre Dixon, delegate from the United Kingdom, attacked that Soviet resolution opposed to intercept radio transmissions and "intentional and deliberate" submarine. Frequently used to British territorial waters, especially when acts of commerce or military interests projects were in progress. "We are not at all satisfied," he said, "with the evidence on which the U. S. has based the Security Council would have to be a 'totally proven' scenario."

Cessna Is Building 'Different' Light Twin

Wichita, Kan.—A four-cylinder light twin-engine business plane of "modern design" being built here by Cessna Aircraft Co., which expects to put the new model on the market in 1962. First flight of the prototype is expected early next year.

The company refers to design details of construction or performance of the new design, but reflections are that it is planned to be directly comparable with the Piper Apache in price. Ed Roskren, vice president Aircraft Division, says the new Cessna will represent "a new approach to two-engine aircraft philosophy and will set a new pattern of thinking and engineering to meet the challenge of changing market needs and requirements that compact designers have developed to break away from the conventional two-engine formula to get maximum performance and safety potential. Roskren indicated that the plane will outperform anything in its class.



CHART plots courses of six Soviet front fighters that approached Alaska coast during 1959 and 1958. Two incidents occurred on St. Matthew Island, north of the Aleutian chain.

33

NASA Plans Three-Man Spacecraft

Washington—Systems design study contracts for Project Apollo, a 1-ton satellite spacecraft that will be the follow-on to the Mercury manned capsule, will be awarded in the near future, National Aeronautics and Space Administration said last week in leading some 1,500 industry representatives to its plans for the next 10 years.

Aerospace research for design, engineering and fabrication of Apollo and its own programs probably will last until at least 1962, NASA said. The vehicle would consist of a command control module, a propulsion module and a service module. It would serve first as an earth-orbiting laboratory and later for manned circumlunar flight.

Research and development and prototype flights are expected to begin in 1962 and end in 1965. Each year would see the Apollo-Agena B vehicle. Full-scale spacecraft will require use of the Saturn and could be flown in 1966.

NASA also told industry it plans 50 scientific satellite launches in 10 years and planetary missions, 41 launches related to manned flight, 25 launches for satellite applications such as communications, and 62 launches for vehicle development over the next 10 years.

Placing heavy emphasis on the degree to which it will rely on industry for help and key to future development is a maximum, NASA told industry of these past papers, most of which already have appeared.

• **Aeros.** Meteorological satellites to fly into 23,000 mi. "orbiting" orbits by the Gemini vehicle. Not expected yet but may be initiated in October 1961 with first launching in 1964. Contractors for the Nimbus meteorological satellite (see p. 21) system integration and basic structure work will be picked early this fall.

• **Range, Surveyor and Prospector.** Range will be a basic orbiter launched by Atlas-Agena B. Surveyor will be a lunar orbiter launched by Gemini and landing 100,000 ft. on the moon, and Prospector will be launched by Saturn to do a mobile laboratory on the moon that would have a landing sites at some 50 mi. • **Minors.** Early planetary probes to Venus and Venus, weighing 600-1,200 lb. and launched by Atlas-Agena B. First one may be flown in 1961.

• **Voyagers.** Later series of planetary probes, launched by Saturn to visit Mars and Venus and probably eight instrumented capsules for atmospheric entry and perhaps landing.

• **Relaunch.** Network of passive communications relays, a follow-on to Echo experiments. Today, Research Center now in operating orbit for studies of ways to solve long reflecting satellite orbits. If studies are successful they may lead to launching of such a network in 1962. Relaunch would follow, probably would require 12 satellites spread around the world to provide continuous communication and would require that several satellites be placed in orbit by a single vehicle. Relaunch may use the Atlas-Agena B for launches in the 1963-1964 period.

Apollo is expected to be able to support life in a period ranging from one month to two months in an earth-orbiting laboratory, or about a year for the circumlunar mission. Mission capsules would be changeable to suit the mission. Crew of three is included, or as many as four of the program. Most reports will be reflected heavily by the outcome of Mercury flights.

NASA's research and space flight studies now goes into detailed program goals for Apollo around results age and are engaged now in intensive research and study programs. This information will be made available to industry—only through a series of briefings at the centers that are to be extensions of the major contractors held at headquarters last week.

NASA Administrator T. Keith Glennan said industry will move on increasing production of NASA's workload involving more system engineering and program management. He estimated that more than 75% of the expected \$1.4 billion-a-year NASA budget will be spent on research. No new major NASA institutions are planned, Glennan said.

director of information services and advertising under Glennan's overall supervision. Glennan usually assigned a public relations manager for Ford Motor Co.'s Ford Division.

Dr. John F. Vickers, first employee of the National Aeronautics Committee for Aeronautics, has retired after 45 years with NASA and its successor the National Aeronautics and Space Administration and almost 52 years of continuous government service. Vickers, 65, held various NASA posts and was vice controller structure since it was absorbed by the space agency in October, 1959. Before then, he had been special assistant to NASA Administrator T. Keith Glennan.

Chicago Helicopter Airways Station 578C crashed in a cemetery about half way between Midway Airport and O'Hare Airport last week, killing the 11 passengers and two crewmen aboard.

McDonnell Aircraft Corp. has applied to the Civil Aeronautics Board for a certificate as a supplemental carrier to both domestic and foreign operations. McDonnell said it would operate the service with DC-8s, Aero Commander and "such other types of aircraft as may be appropriate."

Hiller Aircraft Corp., Palo Alto, Calif., and Electric Aviation Co., Toledo, Ohio, are negotiating merger of the two companies.

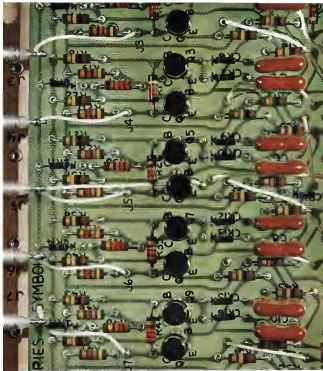
United-Capital Merger

Washington—United Air Lines plan to take over Capital Airlines under a merger, several sources here last week.

The two airlines agreed to merge under terms which would give United common stock to Capital shareholders and bondholders and would give United Airlineage United preferred and common stock plus 15% of the common stock of the United Airlineage. United would support the merger, which would be supported by stockholders of the two airlines and by the CAB.

Under the agreement, Capital stockholders will get one share of United common stock, plus a five-year warrant to buy 1.5 shares of United stock or \$40 in shares for each seven shares of Capital stock held. Holders of Capital's 4,750 convertible subordinated debentures will be asked 33 shares of United stock for each \$1,000 par value of debentures held.

Vacuum Metallizing Industries will get \$15.9 million per cent \$15 per share preferred stock of United, 60,000 shares of United common stock and 75 new warrants to buy 200,000 shares of United common stock at \$15 a share, plus the 15% warrants.



Without electronics it is impossible to design, build, test, launch, guide, track or communicate with a missile. That is why 49% of Martin's 2,540 engineers are electronic/electrical engineers.

MARTIN

News Digest

840 deployment type Atlas E models have been designated as a new series—the Atlas F. First test deployment is at least a year away at Vandenberg AFB, Calif.

General Electric will develop new turbine engine vehicle at its Palmdale plant for the Mark VI re-entry

vehicle for the Titan II under contract to be awarded by USAF.

Ten Strategic Air Command generals are studying terms of duty in SAC's Boeing KC-135 turboprop command post during four-weekly practice exercises.

Martin Co. has named Helmut M. Borne to the new post of corporate director of communications. Joseph M. Rowland will continue to be corporate



Confidence counts and the airlines count on Sinclair

45% of the aircraft oil used by major scheduled airlines in the United States is supplied by Sinclair. Military jets also count on Sinclair to supply Sinclair Aircraft Oil to lubricate their mighty engines. There is no better proof of reliability

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AIR TRANSPORT

Lockheed, Airlines Plan Electra Changes

Modifications begin in November; speed restriction keyed to tests, which could dictate more changes.

Washington—Lockheed Aircraft Corp. will begin its Electra modification program in November, but exact speed restrictions will not be lifted on the modified aircraft until re-evaluation tests are completed.

The tests, which are now being conducted by Lockheed with the cooperation of the National Aeronautics and Space Administration, are slated for completion sometime next summer (AW Apr. 25, p. 46). It is quite possible that the final results of these re-evaluation tests could dictate further modifications beyond those incorporated in the presently planned program before the airplane can be flown at the normal cruise speeds for which it was originally certificated.

A special Lockheed management-engineering team returned to Burbank last week following a series of meetings with 15 airline operators of the Electra to discuss the modification program. As of the last week of last November Airlines, Western Airlines and Eastern Express Airlines had reached agreement on the modification program.

The program calls for a 15-minute extension of the aircraft to the manufacturer to enter the modification line, which is geared to handle about 20 airplanes at a time. Lockheed will assume a major share of specific improvement costs which have been estimated at \$25 million, but the airlines will cover all remaining costs to and from the plant.

Modification program calls for a revision and stiffening of the present engine, search and installation of additional accessory additions of engine and new design fittings to upper and lower engine support structure; large new and diagonal bracing. Structural members will be added to fuselage sides.

Forward and main fuselages will be strengthened. Wing spars from the fuselage, not beyond the wing tips will be strengthened, and some wing ribs will also be stiffened by the addition of new bracing.

In addition, Allison Division of General Motors Corp. is adding a third bearing to the torque shaft of the turbo prop engine. This improvement has not been directly associated with the changes behind the modification materials by Lockheed. Work on the modification program begins July 5 with an Electra which will be turned over to the Lockheed Engineering Flight Test Department Sept. 23. The airplane will be fully instrumented with stress gauges to undergo thorough flight evaluation.

First Electra modified for certification by the Federal Aviation Agency is scheduled to be made by Nov. 16. Target

for the complete certification is Dec. 16.

Logical of the aircraft flow through the modification program is the schedule, which has been suggested only for Eastern Air Lines and American Airlines (AW Mar. 29, p. 47). Eastern of both recent enters the program on Nov. 17.

American's schedule calls for five aircraft at a time, and it is expected that modification of the airline's entire fleet of 34 will be completed by Feb. 1964. Eastern will have three of its 40 airplanes out of service at a time between Nov. 17 and Jan. 1, five out between Jan. 1 and April and seven out from May through June.

At the present time, there are a total of 132 Electras in operation, 26 of which are operated by foreign flag carriers. Total of 24 Electras are on order for delivery.

Chief problems facing foreign flag carriers is the time-time involved in moving the aircraft into Burbank for modification. Australian airlines, for example, anticipate that each airplane will be out of service for at least six weeks, compared with the 30-day period each Electra will be out of service in domestic operations—including turn time. Most carriers are reporting heavy

out-of-service income losses during the modification program, although several airlines will fit the schedule gap with piston-engine planes.

Western Air Lines and National Airlines are still in the talking stage with Lockheed on the proposed agreement. Northwest and Republic have reached agreement on a principle and are expected to sign a final agreement shortly. North west is seeking a schedule that calls for modification of its nine aircraft at a rate of three at a time.

The re-evaluation tests are a program separate from the certification program. Started last spring (AW Mar. 28, p. 46), the re-evaluation tests are being conducted by Lockheed with the cooperation of NASA, which is acting as a technical consultant to the FAA. FAA will make the final decision whether further modifications are required after the re-evaluation of the re-evaluation tests have been analyzed and studied by the agency in consultation with NASA and Lockheed.

Original flight restrictions, which were to stand until the tests were completed, were set at a 275 kt. indicated speed at 35,000 ft. in the normal cruising speed (AW Mar. 28, p. 46). This was later reduced to 275 kt., which is the current speed restriction (AW Apr. 4, p. 47). Original normal operating speed was 274 kt.

The re-evaluation test program calls for a full review of original loading and structural systems and a re-evaluation of all theoretical data pertaining to the aircraft performance characteristics.

Flight tests will be conducted in the highly instrumented Electra now being modified in various shops in the re-evaluation program. In addition, Lockheed is conducting wind tunnel tests at Langley field to check against Lockheed's earlier studies. A third phase of the program will be a series of static tests. No decision has been made yet whether a test instrumented with an Electra will be constructed.

Approximately 200,000 man-hours have already been needed on the re-evaluation tests of the Electra's airworthiness. At the same time, the work force assigned to the job reached a peak of 150 persons. In addition, test engineers of FAA, NASA, Boeing Airplane Co., Douglas Aircraft Co. and Northwest Airlines worked in close cooperation in the overall re-evaluation program. The bulk of the testing phase were worked out in the two agencies, and only has been active in interpreting findings that

American Earnings Drop

New York—American Airlines net earnings for the first six months of 1960 totaled \$2,418,000, down from \$3,281,000 for the same period of 1959. Sales of property totaled \$3,000,000 net after taxes for the first half of the year, compared with \$1,597,000 for the first half of 1959.

The airline's average passenger miles increased 7.9% to 3,235,000,000, the coach average being 4.6% and first class up 12%. Air freight and mail up 25% to 14,718,000 ton miles.

Non-Union Pilot Seniority Issue Sparks ALFA-Southern Dispute

By Robert H. Cook

Atlanta—Prospects for immediate settlement of the seven-week-old Southern Airlines pilots' strike appeared dim last week, as management and labor refused to give ground on issues which involved a dispute between the Air Line Pilots Assn. and all major carriers serving the southeast.

Core of the ALFA-Southern dispute is the issue of seniority when pilots hired by the airlines after the strike have left their jobs. Southern insists that these non-strike pilots be removed with great urgency after the strike is settled, a position ALFA refuses to consider. ALFA has threatened to halt all senior service to cities served by Southern through a corporate flight or pilots of other airlines operating to these cities. This threat is being countered in court by American, Republic, Continental, Eastern, National, Trans-Texas and Trans World Airlines, the carriers which would be affected.

These carriers have filed the U. S. District Court in Chicago for a restraining order and injunction which would direct their pilots to ignore Southern pilot picket lines. Official of cities which would be affected are conducting emergency sessions to plan for the possible arrival and disposition which would direct their pilots to ignore Southern pilot picket lines. Official of cities which would be affected are conducting emergency sessions to plan for the possible arrival and disposition which would direct their pilots to ignore Southern pilot picket lines.

ALFA terms the court action premature and says the union is prepared for a long, slow-motion fight. Southern has several seniority pilots to return to non-union pilots and expects to return service to all of its 41 cities by mid-August, with a full schedule pattern in service by October.

Presidential Bond

An ALFA sympathy strike could trigger appointment of a presidential mediator fast finding strike. Southern would recommend a solution and which the union indicates it would welcome since the company has refused to submit the strike issue to arbitration. If the court in the court's strike, the National Mediation Board sees little chance for an emergency board to be appointed.

Although ALFA has not ended out its sympathy strike threat, union publicity indicating that it will has had a

significant effect on headline business in the Southeast.

Atlanta Air Lines enters it is getting 10 to 40 cancellations immediately out of Atlanta and that it handled 1,100 fewer passengers last month than in July, 1959.

For the first time in the air industry have more than 100,000 passengers who expect them to not appear at the labor dispute might visit in these many important connections and routes. Southern's corporate flight, Eastern Air Lines, cancelled several flights and estimated that Atlanta bookings were down 10% from the same month last year.

One of the airlines would completely report the effect on other major cities in the area, but they noted Atlanta with its average daily departures of 5,000 passengers as the most important traffic hub where effects of the strike would be noted.

While proposals and counterproposals have been made by both Southern and the striking pilots, any hope for progress toward a final settlement hangs directly on the status of 75 non-union pilots hired by Southern to replace the strike—a point accepted by Moses Blumfield and NMAB. Merit is essential here, rather than of seniority, but for any agreement on how working issues unless the pilot meet a settled deal.

Southern Position

Southern contends that the striking pilot's contract demands cover "lifetime" seniority, which would mean that the company would have to pay \$100,000 over a two-year period. Although the pilots withdrew a demand for "day in" clause providing a partial payment for pilot going back, the service charges the money withdrawn a new pension demand which would cost even more.

The airline said it fully intends to pay its new pilots when "seniority" could be to maintain operations and told the strikers that any new contract must provide that the new pilots have full seniority pensionable over the strike and the company have the right to refuse to employ a pilot who has not been engaged in an emergency during the strike.

ALFA maintains that its working contract demands no strike, as a concept to give the new contractual advantages already in common use as most traditions and most senior service and in such they can not be denied. Furthermore, Southern pilots will not be willing to continue to

making these issues, but not at the expense of accepting Southern's demands that they be placed on the bottom of the seniority list.

Agreeing to the airline's seniority stand, pilots said, would automatically mean that only a small handful of the 147 strikers would come to work, and these would be senior men with 11 years or more experience who would limit themselves to a "house" operation. This would mean that pilots employed by Southern a matter of weeks.

Negotiations between Southern and its regular pilots began in July, 1959, and continued to the time when the National Mediation Board named arbitrators on the ALFA NMAB panel the parties on Feb. 17. Following the 14-day strike, the parties agreed to meet on Feb. 17, the same day a May 4 strike day, but withdrew it to participate in three emergency mediation conferences called by the NMAB.

Mediation Fails

Further discussions were abandoned, and a June 4 strike date was set after an NMAB suggestion that the hours be reduced to 40 hours per week. Southern and Southern and accepted by ALFA. Three other sessions with the NMAB, called at the assistance of Mayor Beaufield from the strike began, also have failed to break the deadlock. Strikers got \$538 to \$538 monthly benefits from a special ALFA agreement.

Southern was forced to drop its fight between June 6 to a day to only four and, following \$18,000 expenses out of total personnel of 600 as an immediate result of the strike. Many longshore employees have gradually been recalled as the airline has now ordered service to 22 of its cities, but the battle is still going on. Southern has about 21% of its total senior pilot pool in job, and in the first month of the strike spent \$111,510 in commercial routes, compared with more than \$100,000 for the same month last year. Lost business which averaged about 14% at the time of the strike rose 44% on South flights in July, the airline said. Southern said it expects 75 new pilots and said it is considering to accept from a backlog of applications, most of which are its capital position. About 10 of these new men have been dropped out and are being the last. Southern estimates the average applicant completes training and a Federal Aviation Agency check within three weeks on a schedule that is now producing the cross a new man.

The new men do not have firm contracts with a written guarantee of continued employment, Southern said, and they were hired at a salary rate of \$17.75 a month. Southern said it is a month for complete, which is the

average wage of the striking pilots. Southern added that the new men could be assigned a little better pay than senior pilots on an incentive plan that provides an extra allowance of as much as 33 cents per pilot mile for each mile flown in excess of 1,000 during a month.

The airline also disputes ALFA claims that the new men pilots are either available or incorporated for their position and contends that in a group of 75 captains hired to replace flight engineers was 10,500 or less and average age was 39. A large percentage of new pilots appears to have come from American Airlines, which has been operating as a feeder airline. Southern says that OGC Co. and several South American airlines.

Both union and management are heavily in agreement on senior provisions which would provide an eight-year option with \$13.15 a month for full day, half night schedule by May or June of next year. This salary would amount to \$1,135 for Marine 404 monthly rate of which will be required by the end of this year, Southern said. The airline added that prior to the strike it had offered the pilots increases which would have brought salaries to \$15,100 annually, for senior captains on \$18,100 annually.

The striking pilots' growth agree on the airline provisions but tend to demand an added offer of larger pay increments that they have not given the company at present (W. Marine equipment). Then on the higher pay would only apply to a few senior pilots in the last six months of the contract.

Comparing contract proposals submitted by both parties on July 11 and 12, ALFA disputed its demands for a duty day which would provide one hour of pay for each hour flown over from leave to a regular normal contract provision which pay only for straight flight time. ALFA added a new demand that the company assume the full cost of its regular pilot pension plan under which pilots contribute to the plan (see salaries and Southern 44). Southern says pilots that while the duty day would have cost an extra \$13,100 annually, as savings of the extra seniority plan would cost the company \$15,640.

ALFA also wants an 85 hr monthly flight limit, which would provide that an unaccompanied flying time such as training or deadhead flights, would apply for both senior and junior flight time limitations. The strikers wanted this as a standard provision on senior pilots but Southern contends it is not needed since these pilots have already received 78 flight hours a month. The airline wants at least 2.5 hr credit and pay for time spent in the

course of training program, as growth that this could lead themselves in a position of being assigned to training for as long as two weeks and then being forced to fly 60 hr in the remainder of the month without an opportunity to regain the job lost by 35 hr. Southern makes the point that it is not the purpose of applying and that of forcing a higher salary to the pilots. They add that Southern expects to begin Marine 404 training during the fall.

Southern also is opposed to the strikers' demands that the airline provide a minimum of one reserve captain and one reserve first officer and point out that such a change would require the hiring of more pilots at additional expense. The point, along with two other working provisions, was submitted to NMAB last week for information.

These demands, plus senior issues involving an increase in sick leave time pay, for flight scheduling but later cancelled and recalled afterwards, Southern contends, would mean the airline's loss of \$100,000 a month.

As an added demand, ALFA wants a signed letter of understanding that the airline will agree to negotiate the matter of additional flight crew members whenever the position might arise. ALFA spokesmen said that was added "in the future event" that Southern might get larger equipment requiring a third crew seat. This senior new aspect is \$15 DC 8.

Anti-Violence Measures

Southern got an anti-violence agreement from the strikers in July. Southern also reports that the property of and its own senior pilots had been recalled. In addition, the airline has guards around its hangars and a special guard for training non-union pilots stationed at an Atlanta hotel at company expense.

ALFA denies the conditions charge and says it had offered a reward of \$100 for any information leading to the arrest of alleged violent spokesmen for the Atlanta office. Southern said the conditions charge was fostered by Southern as a means of getting the protection agencies and meeting press demands for the strike's progress.

Striking pilots view this demand as an effort to gain pay and working conditions on a per work pilots employed by airlines with operations outside the Southeast.

ALFA also said that American Airlines that has greatest concern over the issue, which should have remained on a local basis, was the entry of an "unauthorized organization" in the strike, which the airline it poses to the public interest. The airline particularly noted with ALFA threats to shut down

other operations throughout the Southeast as including such the "unauthorized" of the public and the airlines to take immediate action should any move be made to pilot in interference with operations at the Atlanta-McCollum Airport.

FAA Limits Insurance Hopes Airports Follow

Washington—Federal Aviation Agency dropped a ceiling of \$165,000 last week on the amount of airplane liability insurance a passenger may purchase at the Washington National Airport for a TWA flight.

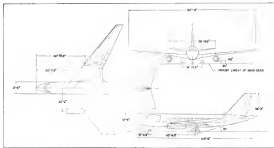
FAA, which operates the airport for the federal government, hopes the limitation will be mirrored by other commercial operators throughout the U. S. Currently, it is possible to buy as much as \$475,000 per passenger at Washington National for each pilot, but FAA Administrator E. R. Quastad told Airlines Press that an investigation is under way to determine how much can be purchased in a number of large airports in the U. S.

Purpose behind the FAA move is to reduce the cost of trip insurance payments and to discourage tourist claims as a means of reducing on insurance. The airport authorities have been on the verge of terms accident insurance a person may purchase elsewhere.

Quastad and pilots' rates will be reduced by switching from the present system of charging insurance commissions a percentage of insurance sold only one. That he has been called to order. Under the new system, FAA has been collecting as much as \$250,000 on the approximately \$500,000 in insurance sold annually at the Washington National Airport. Under the new regulations, FAA said it will be cut sharply to about \$140,000.

FAA both that strong in travel here should be passed on to the hotels, and, therefore, it will grant franchises under competitive bidding based on the programs to be charged insurance purchases "while pending on improving team of coverage in present contracts." This ruling is the volume of insurance due on the 30-day period is expected to put a drag on spontaneous attempts at in-flight self-insurance.

FAA also feels that because air travel is becoming increasingly risky, cost of insurance to the passenger is a considerable high for the risk involved. The agency also said it believes that the amounts of insurance, which can be purchased at an airport should have a reasonable relationship to the normal cost of the traveler's normal insurance needs.



CONVAIR's proposed short-range jet transport, the Model 60, has extreme configuration similarities to the Convair 440.

Convair Surveys Market for Model 60

Washington—Convair Division of General Dynamics Corp. is conducting a market survey for its proposed short-range jet transport, the Model 60, which can be available for delivery approximately two years after initial orders are signed.

Designed primarily as a replacement for the Convair 440, 580 and 440 series, the Model 60 is a swept-wing transport powered by two turbojets mounted in short independently fair a high capacity, high-speed, short-range transport and a low operating cost per airplane mile it will sell for \$15.5 million.

Powerplant Choices

Performance figures projected by Convair are based on the use of two Pratt & Whitney JT3D-10 turbofan engines, each rated at 20,000 lb. sea level static thrust. Similar performance can be obtained with two General Electric CB865-11C1 turbofans suggested, rated at 22,000 lb. sea level static thrust each. Engines are positioned side-by-side on the wings.

The Model 60 combines the aerodynamic, structural and systems design of the Convair 580 and 600 transports with an increased configuration similar to the 440. Wing area of the Model 60 is 2,900 sq. ft.; and span is 120 ft. Wing sweep is 15 deg. at 10% chord. Dihedral is seven degrees, root incidence is two degrees and apex angle is seven. The wing will be equipped with double

slotted flaps and extendable slats on the leading edge.

Fuselage length is 109 ft. 5 in., with a maximum outside width of 11 ft. 6 in. Maximum height of the fuselage is 32 ft. 5 in. Forward lower cargo area, perfect will have a capacity of 385 cu. ft., aft lower hold will have a capacity of 257 cu. ft.

Total of 177 seat rows with a 38 in. seat spacing in a two-aisle configuration will provide 65 seats. Pre-chamber seating arrangement will provide a total of 53 seats.

Mixed tourist, first-class configuration is also possible at various ratios through the installation of a bulkhead in place of one seat row.

Luggage, buffet, rest-room, baggage area and a stowdown seat are located at each end of the cabin. Forward

Viscount Replacement

Random-Vickers-Aeritalia is currently evaluating the engineering and marketing aspects of the ex-Hawker T.107 (July 68, p. 42), which it may produce as a Viscount replacement. The transport, which will be powered by two jet-mounted Bristol Siddeley BS75 turbofans, will have maximum cruising speeds at economy climb of 55. From a 10,000 ft. altitude, it will have low gross weight, less than that of the Viscount. The airplane has attracted U.S. airline interest.

common baggage hold will have a 70 cu. ft. capacity, aft hold will have a 60 cu. ft. capacity.

Two main entrance doors 47 in. high with an average width of 34 in. are located on the left side of the airplane, one forward of the wing and one aft. Opposite the main cabin entrance are 24 x 48 in. service doors. Two emergency doors give the airplane a total of six emergency exits.

Passenger windows 9 x 12 1/2 in. are located in a row six seats wide. Airplane has a flight engineer's station behind the cockpit seat. An observer's seat is located behind the pilot.

88-Seat Version

With a 48-passenger configuration, the Model 60 has an operating empty weight of 30,000 lb. Takeoff weight with a normal payload of 34,940 lb., and maximum fuel weight of 44,000 lb. is 109,540 lb. With maximum payload of 36,070 lb., ramp weight is 141,500 lb.

Using the 55-passenger configuration, airplane has an operating empty weight of 30,580 and a ramp weight of 143,315 lb. with a normal payload of 33,425 lb. and maximum fuel weight of 44,000 lb. With a maximum payload of 19,585 lb., ramp weight is 141,425 lb.

Maximum takeoff weight of the Model 60 is 145,000 lb. Maximum sea level weight is 102,000 lb. and maximum

Air Defense Exercise

Washington—Commercial airlines operating in the continental U.S., Canada and Alaska will be required to ground all aircraft for a one hour period between 8:00 a.m. and 7:00 p.m. Eastern Standard Time on Sept. 10 because of a North Atlantic Air Defense Command exercise named Sky Shield which will be conducted during that period. Exercise will require airline pilots and controllers to remain on duty as in defense.

Maximum landing weight is 140,000 lb. Maximum cruise speed with maximum cruise thrust at 115,000 lb. air-craft weight is 540 mph at 19,500 ft., 525 mph at 20,000 ft., 510 mph at 21,000 ft. and 500 mph at 22,000 ft.

Rampy requirement at sea level with a four-engine aircraft payload and an 8,500 lb. fuel reserve is 5,700 ft. at standard temperature when operating on a 200 and no flight. At standard temperatures, operating over a 1,200 mile sea range, runway requirement is 5,100 ft.

For the same range, but at 90°F, runway requirement is 5,870 ft.

Landing runway requirement at sea level at a maximum landing weight of 140,000 lb. is 5,600 ft.

Range of the aircraft with normal payload and maximum cruise thrust at 25,000 ft. is over 1,600 statute miles. With speed requiring Mach .52 at 25,000 ft., direct operating costs of the 55-passenger configuration model will be 1.46 cents per seat statute mile over a 1,300 mile sea range.

Eastern Air Lines is currently studying the Convair Model 60 for short-haul, medium-haul operations. The airline has also done substantial studies on the Boeing 727 three turbofan, short-haul, medium-haul transport, although it says that Boeing has not yet submitted a competitive plan for long-haul transport. United has hinted that it is interested in a maximum of 48 Boeing 727s.

TWA, American Fined Heavily by FAA

Washington—The Federal Aviation Agency issued separate civil penalties on two airlines last week for crew check and maintenance violations.

Trans World Airlines paid fines totaling \$15,000 for failure to have 70 flight engineers checked for competence in the 12 months prior to Apr. 30, 1969.

American Airlines paid fines totaling \$9,000 on seven maintenance violations, including one case where the carrier failed to conduct an enroute loading inspection on an aircraft.

Examiner Urges Hawaiian Airlines Be Awarded Route to West Coast

Sweeping changes in the U.S. airline pattern in the Pacific have been recommended by Civil Aeronautics Board Examiner William F. Madden, whose decision in the long-running Trans-Pacific Route Case notes the need for a "new concept" consistent with the capabilities of jet transports.

Madden recommended putting Pan American World Airways and Northwest Orient Airlines "on an equal footing" with respect to West Coast routes for their transpacific services, then calling a hard-fought and lengthy battle between the carriers by giving Pan American a great coast route across the North Pacific and giving Northwest a Central Pacific route via Hawaii.

Pan American, as the examiner's recommendations would see the long sought goal of East Coast and inland continental for its Pacific services, with the right to operate from Boston, New York, Philadelphia, Baltimore, Washington, Denver and Chicago to Honolulu. Overland, with Fairbanks designated as an intermediate point.

In another aspect of the consolidated proceeding, which involved applications of some 11 carriers, Hawaiian Airlines won the examiner's recommendation for West Coast-Hawaii service.

Examiner's Recommendations

Elaborate in the case began last November and followed World House arguing that the entire Pacific route carriers be considered as a whole by CAB. Examiner Madden also announced:

- Authorization of scheduled trans-Pacific all-gate service by Flying Tiger Line as a freewheel, non-exclusive basis
- Extension of Trans World Airlines' month-long route beyond Honolulu to Tokyo via Hong Kong, with renewal of Bangkok-Mumbai intermediate until Hong Kong or Tokyo service is requested

Referred for the year of South Pacific Air Lines' temporary authority to operate between San Francisco and Los Angeles and Fiji en Honolulu, Bora Bora, Tahiti and Samoa, and now authority to carry mail on a non-exclusive basis. Passengers are to be carried between the West Coast and Honolulu only on flights operating between Honolulu and Bora Bora or beyond.

• General Air Lines' route 113 with its route 1, substituting Honolulu for Oakland and Los Angeles, respectively, as a western terminal point. Addition of San Diego as an intermediate point in enroute service.

• Extension of Pan American's South

Pacific route beyond Sydney to Tokyo.

• Immediate removal of Northwest's authority to serve points in Korea, Guam, and Taiwan, and of Pan American's authority to serve points in Viet Nam, Singapore, Sumatra, Java, Federation of Malaya, Thailand, Burma, and points within India and Pakistan north of the 12th parallel. Goodwill paid by Pan American of two Pan Eastern route authorizations. One effect is to grant PanAm to fly directly between Hawaii and Tokyo.

But the fact that the CAB examiner described the possibility in the first major international and overseas route case in which the impact of jet aircraft may be considered and appraised. While only a suggestion of a new concept, case possibly ended, there is enough to establish that the new aircraft will provide almost double sea capacity, will follow flight times, will provide a new concept of a "new concept" and will be greatly extended airport usage.

Great Circle Routes

Obviously, this will mean full use of great circle routes will be made between major U.S. cities and points in the Orient. Economically, the new concept will assume that traffic will be considered to an extent and in an amount not possible as it is possible by any single method or improvement.

Madden issued U.S. Orient route removals by several points in the case to allow a new route to be established and the examiner selected a total 1962 volume of 300,000 passengers in a fully operational U.S. Orient, U.S. flying carriers will obtain an average of 75% of the eastern business.

Pan American and Northwest, however, came up with drastically different forecasts of the distribution of passengers between the West Coast and the Orient, according to which Pacific routes they will follow. Northwest predicted that 72% of these passengers would travel via the Central Pacific and 28% via the North Pacific. Pan American's respective percentages were 13% and 87%. The examiner found a 70-30 split to be more likely "when the great step of the jet is weighed against the present pattern of service." According, he recommended that the route pattern have moving traffic between the eastern U.S. and the Orient would best be found by assuming an intermediate point in the Central and North Pacific meetings.

Airlines, MATS Meet on New Contract Plan

By Katherine Johnson

Washington—Seven air carriers are negotiating with Military Air Transport Service to negotiate contracts which will reorganize the purchase of military cargo aircraft for the next eight years.

This is the first step in implementation of a new program under which MATS plan to broaden competitive bid contracting which has accounted for over 95% of MATS business in the past. Congress and industry have long objected that the competitive bid practice permitted carriers no chance to increase their military cargo fleets.

The current contracting process, held at MATS headquarters in Scott Air Base, are Pan American World Airways, Trans World Airlines, Northwest Airlines, Southeast and Western Airlines, United Air Lines, Alaska Airlines, and Boeing Airways.

The conference is dealing with contract terms for the shipment of MATS passenger and cargo traffic on regularly scheduled commercial flights. This is the first contract for the new MATS program (AW May 16 p. 39) recently approved by the Department of Defense. First of the carriers—Pan American, Trans World, Northwest and Southeast—personally submitted in order to ship government traffic at reduced rates over their regular routes, but most routes were not proposed (AW May 16, 1959, p. 47).

The two other categories of traffic under the new USAF program are:

- Traffic moving to place load lots. This will be purchased by competitive negotiation.
- MATS expects to open negotiations for contractors in this category in mid-August.

- Small business air-side traffic. The USAF program states that this will be a quantity reduction in more adequate participation by small business.

The deadline for negotiating new contracts is Sept. 30 when current MATS contracts, totaling \$42 million, expire. Two major objectives of USAF in its negotiated contract program are to obtain commitments from carriers to purchase turbine-powered cargo aircraft and to expand capacity available in MATS in its emergency period on September period. Carriers already have made commitments from their fleets in an all-out emergency period under the Civil Reserve Air Fleet program.

USAFA has been unable to gain fleet commitments for partial mobilization, primarily because the extent to which a carrier's fleet might be withdrawn for military work would affect its competitive position with other carriers.

The Air Force program states that

advertised bid contracts will be restricted to if the negotiated contract plan fails to achieve its objective of "prices acceptable." Defense Department reported this in its report approving the USAF program, stating:

"It is understood that advertised competitive bidding will be used for the procurement of transportation airside when terms and rates acceptable to the Department of Defense cannot be obtained through negotiation."

The assigned Air Force program would have made negotiations of MATS contracts contingent upon the separate bid of turbine-powered aircraft by the commercial carriers. This was created by Defense Department, and carrier acquiring jobs will not be given preference. Defense also directed USAF to consider DC-7F and C-124H cargo aircraft "as being needed."

An Air Force program also assigned West Coast carrier with Canadian CL-44s, the first turbine-powered cargo aircraft that will be available commercially, will have "the pick of the MATS fleet" for future negotiations. The three carriers that have ordered CL-44s are Flying Tiger Line, Southeast and Western, and Shick Airways.

Meanwhile, USAF reported these developments in its program to meet current MATS war cargo fleet.

- Advanced "workhorses" aircraft. Air Research and Development Command

is scheduled to submit first and detailed Service Operational Requirement to Air Materiel Command for present action by Sept. 1. USAF and Federal Aviation Agency have already reached basic agreement on the characteristics of a cargo aircraft suitable for commercial and military operations. Congress appropriated \$70 million in the Fiscal 1961 budget for research and development on this advanced aircraft to replace the C-124 as backbone of the MATS fleet.

- Fabricate modifications. USAF has decided to buy 50 Lockheed C-119B aircraft (C-119B with extended wings) to meet Army airlift requirements—up-down and short field capabilities—under an 108-month program for interim MATS modernization. Defense has also approved turbine-powered aircraft with fast turbine capability is being developed for the replacement of low level U. S.-Canadian discussion on a possible "joint" order which Canadian CL-44s for MATS would be exchanged for U. S. lighter aircraft—C-119B, C-124, and C-130.

Following are highlights from the Air Force report on its new MATS program:

- The present lack of civil cargo capability necessitates the use of military aircraft to carry cargo which would go on civil routes if they had the capacity.
- The reduction of MATS channel traffic operating a contingent upon two design being developed. One is the sound capability of commercial carrier at acceptable and profitable prices and committed to the wartime work task. The other is the amount of channel traffic that will be accomplished by the utilization of MATS aircraft in training potential to execution of its wartime airlift mission.

- "There is no intention to eliminate MATS' global reach."
- "Any increase" in the amount of channel traffic given civil carriers would be counterproductive with current freight capability produced by civilian freight carriers.

Under the present program, aircraft made available at prices acceptable to the Department of Defense and comparable with the effective utilization of "MATS."

- When the development program is established for the advanced cargo type suitable for MATS and commercial agencies, "competition may be given in the amount of development."

In this connection, civil carriers support flight test and acceptance costs. Consideration may be given to sharing in metal delivery to make cost out comparable between military and civil procurement.

Conspiracy Charged

Washington—German National Airways told the Civil Aeronautics Board last week that four airlines, and the Air Transport Union, are conspiring to drive German National and other independent carriers out of military traffic.

In a complaint filed with the Board, German National charged Pan American World Airways, Northwest Airlines, Trans World Airlines and Southeast and Western Airlines with denying bids submitted by GNA and the other independent carriers of the Military Air Transport Service for military aircraft contracts under the period Oct. 1, 1946 to Sept. 30, 1959, then agreeing to collect bids from the independent carriers' fleet.

German National also accused the Air Transport Union of submitting to the Air Force Department an ex parte report attempting to persuade Defense to "unilaterally discontinue utilizing the services of GNA and other carriers not affiliated... and to effect an arbitrary diversion of military transport to transportation over the routes of the carrier defendants from GNA and other carriers."



Soviets Push Foreign Sales of Il-18

Soviet Union, stated that the Il-18 military transport meets all America's operational requirements to push the aircraft as foreign markets. Czechoslovakia, intent of foreign bids to purchase the transport, is operating the Il-18 in its Prague-Dresden-Brighton route (AW July 13, p. 58). IIL is also operating on Chinese Civil Air Service route between Canton and Peking (AW July 21, p. 33) and on East Germany Luftbahn route (AW Apr. 11, p. 49). Airplane, above, is seen at Duxford Airport.

A. V. Roe Proposes Swing-Tail Assault Freighter Based on 748

By John Trimball

London—Aero 748, an assault freighter version of the 748 military transport, is being proposed to the British and Indian governments by A. V. Roe & Co. Ltd.

The project would mount the 748 wing high on a new fuselage with a swing tail. Main landing gear would be attached to the fuselage, rather than to the wings as on the 748 (AW Feb. 11, p. 118). The 748 cockpit would be retained.

The Aero 748 has made 20 flights for a total of 60 h since the first flight on June 24. Aero chief test pilot J. G. Harman and the aircraft test to light now at maximum speed and low-altitude at lower speeds. Tests are being timed as to effect to correct the fuselage without returning to vortex generation. Other work, Aero reports on engineering difficulties with the aircraft.

On its first flight the 748 flew at the design penetration figure and was equipped with all systems. The aircraft was wind-tunnel but not trimmed. The aircraft has since flown at its maximum design speed of 35,100 ft and to a speed of 278 ft.

Stalling characteristics have been investigated in various configurations, as changing full power to a new control power configuration. About 200 tests have been made. The full range of gusts again has been investigated with the aid of a vortex buffet system in the aircraft which enables a full order of gusts (half) to be made in 10 ft.

Agreement Board report have given the 748 as all military configurations.

The 748 test results was taken out of the flight program for three weeks for a structural check and first mission design, including investigation of engine vibration, vibration, vibration of the porting and some cockpit changes.

Some rearrangement of the cockpit throttle quadrant is to be made to eliminate installation of a Doors wingcock.

All warning lights in the cockpit are designed to go on just to cockpit check, is in the Aero Velox header. At least all warning lights should be off.

Test flights have been made with radar navigation aids installed, and a navigator to relieve the pilot of navigational duties.

The second Aero 748 prototype is expected to fly in December. The first

production 748 is scheduled to fly next spring. In addition to these aircraft, two aircraft are being built for testing. One of these will undergo fully simulated flight order to destruction.

Four freighter 748s and three double-wing 748s have been proposed to meet a production rate of five aircraft a month.

Production of 18 Aero 748s was originally authorized, but production of an additional 20 units of components has now been approved.

Deliveries of 748s to return will begin this year, although A. V. Roe does not expect full completion until August.

The company has five orders for eight 748s. Five of these are for Series 1 aircraft powered by two Rolls-Royce Dart R.6 V16. 514 turbine engines in 1,725 hp each, three of the first order are for Series 2 748s, powered by two Rolls-Royce Dart R.6 V16. 514 turbine engines rated at 2,195 hp.

British ministry of defense has ordered the first act of production and has made the first set of plans for the planned production of the 748. First phase of manufacture in India will be involved in assembly by purchasing operations completed in Britain. Until now the Indian government intends to produce components and components such as the landing gear. The second 748 is powered by two Rolls-Royce Dart R.6 V16 turbine engines.

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Disputes Rise Over New Capacity Policy

By L. L. Doty

Washington—A reshaping of U.S. foreign civil aviation policy that could force a breach between the U.S. and at least three European nations is now in the making.

The policy change, which is designed to strengthen the competitive position of U.S. flag carriers in European markets, will be put to its first test Sept. 12, when the State Department meets with a Scandinavian delegation in Copenhagen to discuss revision of a bilateral air transport agreement. The outcome of these talks will determine the extent the U.S. will follow an agreement with The Netherlands and Belgium.

In essence, the U.S. will seek to tighten controls on the volume of traffic coming from the U.S. and Sweden to other foreign countries by Scandinavian Airlines System—the airline consortium comprising Denmark, Norway and Sweden. U.S. also will seek to police the amount of traffic through a reciprocal exchange of traffic rights covering cargo and destination of passengers.

The Scandinavians will fight the proposed capacity restrictions because an extension of the Fifth Freedom traffic banished beyond Copenhagen from the U.S. Denmark will seek to enter foreign countries will normally cut into the carrier's revenues. It will oppose the proposed exchange of traffic rights for virtually the same reason: a majority of flag carriers have previously fought such proposals—such restrictions are not required under a Brussels-type agreement and possible industry figures should not be made public domain.

A deadlock on these issues at any future treaty session, therefore, might well understandably move the argument up to top diplomatic levels. The international agreement major nations are now placing on civil aviation relations is known as "The Netherlands" in relation to its failure to reach understanding terms with the U.S. in bilateral talks earlier this year (AWF Feb. 12, p. 26).

Dutch Resolution

At that time, Dutch Foreign Minister Joseph M. A. H. Luns told the Dutch House of Representatives had adopted a resolution supported by all political parties that charge the U.S. attitude on civil routes "does not fit into the relations between allies." He said it was the fact that the Dutch Parliament had confirmed such a strong statement about any ally.

Key to the controversy hinging between the U.S. and the three Scandinavian nations lies in the widespread

difference in interpretation of the provisions of the Bermuda Agreement—the air transport pact signed by the U.S. and Bermuda in Hamilton, Bermuda, in 1946, which has since served as the prototype for all air transport agreements signed bilaterally by the U.S. with each of 53 nations except Czechoslovakia, Iceland, Ireland, Spain and Turkey. The latter five agreements are modeled after policies set in the Chicago Convention of 1944.

The Bermuda-type agreement has been applied officially by both the U.S. and Britain, although there are liberal groups in both countries who are advocating a free-market formula for basic agreements—one especially that would put an end to international wrangling over routes, capacity and rates. "Such a case, in our opinion, either from the U.S. and Britain, leave the Bermuda concept."

As it now finally put together, the Bermuda Agreement was a compromise between liberal concepts of competition philosophy of the U.S. and the severe restrictive policy of the United Kingdom. Consequently, it is a rigid, more ambiguous document that has caused some serious—naturally since, his nations, other than the U.S. and Britain, have the Bermuda concept in the U.S. under protection from cargo through the airport setting or interpretation of their agreements.

As traffic schedules sought to create a new format of competition an international context, the final toward

offer restrictions on capacity offered by U.S. carriers appears to grow. And with an increasing number of flag carriers now satisfied with routes they are operating into the U.S., there are few indications of resistance to increasing wedges as U.S. attempts to block these restrictions. This has been particularly true in recent negotiations between the U.S. and Britain (AWF June 21, p. 55).

The U.S. has now found capacity restrictions on air flag carriers to be a means of restoring competition. It is a fact that, in some nations, the Civil Aeronautics Board has signed more routes in less foreign nations in the opening positions of foreign air carrier permits it has issued, but generally, most airlines have been slow to take U.S. offers without any hesitations on route volume other than their impact on the Bermuda principle.

Bermuda Agreement

The Bermuda Agreement and its counterpart provide for a control of capacity. In essence, the capacity clause prohibits the signing of two countries from over-scheduling by keeping scheduled air service to traffic demand. The clause further requires that the extent of the lower country will schedule flights between it and the opposite country via other countries on the route as "primary" schedules. Any schedule which is less than the capacity of the lower country beyond the opposite country to third countries on the route are "secondary" schedules. Traffic served on the latter schedules is restricted by the U.S. to no more than Fifth Freedom traffic (see box).

The "five freedoms agreement" was evolved at the Convention of International Civil Aviation held in Chicago in 1944. The agreement was not accepted unanimously, and Britain refused to ratify it. The U.S. signed it and, although it withdrew from the agreement in 1946, the agreement principles have remained as a basic agreement in most bilateral air transport pacts.

Purpose of the capacity clause is to provide a measure of control over the five freedom principles by ensuring that scheduled air service be closely related to traffic demand. However, since there are no established standards governing this relationship, capacity restrictions can be set by consultation between the two governments of the bilateral agreement.

The U.S. has asked for talks on capacity with the Scandinavians in accordance with the consultation procedure. It will attempt to prove in these talks that SAS is not living up to Fifth Freedom traffic—that traffic, according to the

Five Freedoms

Washington—The Five Freedoms of the Air Agreement, which arrived at the end of several agreements at the International Civil Aviation Conference in Chicago in 1944, was signed by only a few of the 54 nations represented. In all its bilateral agreements, however, the U.S. has retained the liberty of these five freedoms:

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- **Fourth Freedom**—The right to land in a foreign country passengers, mail and cargo destined for the home country.
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Outfits of Lockheed 1649A from passenger to cargo configurations for Lufthansa German Airlines shows large hole cut in forward fuselage for forward cargo door (bottom left) and fuselage skin replaced due rive cargo door installation (bottom right). Model 1649A has a range of over 6,000 mi., providing nonstop cargo flights between New York and the European continent.



U. S., that moves beyond Scandinavia from the U. S. to other countries as secondary traffic but as primary traffic, thus taking more than its legal share of such business.

The Scandinavians will argue that this traffic is not Fifth Freedom traffic but is "South Atlantic traffic" and is therefore, not subject to the conditions of the bilateral. It is SAS' position that any traffic picked up en route in third countries is legally Fifth Freedom traffic, but that any traffic covered beyond Scandinavia to third countries in South Atlantic traffic and is outside the jurisdiction of the bilateral. It will claim that the capacity clause has been misinterpreted by the U. S. with respect to South Atlantic traffic.

U. S. Contention

The U. S. carriers are now arguing that only a small portion of U. S.-Europe traffic (served by SAS) is destined for Scandinavia—not industry spokesmen estimated the amount to be about 15% of SAS' total traffic. The bilateral change, is Fifth Freedom traffic ultimately destined for other European cities, such as Hamburg, Paris, Geneva, Rome or Madrid, which are served by SAS.

In addition, U. S. carriers say that some of SAS' traffic is dropped off at Hamburg on transatlantic flights en route to Scandinavia. At Hamburg, SAS picks up this traffic on its local regional flights to other European cities.

U. S. airlines charge that all such traffic drains European business away from them.

SAS Position

SAS maintains that even over the night to carry automatically any traffic beyond the contents of its flag. It states that the bilateral agreement does not include South Atlantic traffic and that the agreement cannot be interpreted to include such traffic. Eventually, the Scandinavians want that route between national powers as the only one subject to the provisions of bilateral with third countries.

Here are specific examples of SAS' position with respect to Fifth and Sixth Freedoms.

• Traffic carried on SAS' route between New York and Copenhagen that is

dropped off at Glasgow—a third country—is Fifth Freedom traffic and subject to control under the provisions of the bilateral agreement.

• Traffic carried on SAS' route between New York and Copenhagen and continuing on to Rome, for example, is South Atlantic traffic.

In recent years, the U. S. government has made two major route grants which effectively permit a larger flow of Fifth Freedom or secondary traffic than primary or Fourth Freedom traffic—a direct conflict with the government's interpretation of the Reynolds capacity clause.

Route Award

Last year, the Civil Aeronautics Board awarded a route to British Overseas Airways Corp. from Tokyo to London via San Francisco and New York (AWB June 1, 1959, p. 41) although the Board expressly had warned that the majority of traffic handled on the route would necessarily be Fifth Freedom traffic.

Earlier, the American World Airways was awarded a route between San Juan, Puerto Rico, and Spain and be-

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Soviets Develop Taxi Version of Coaxial Ka-18

Version of the Ka-15 coaxial helicopter (AV, Jan. 35, p. 47) has been developed as an air taxi by a Soviet design group headed by Nikolai Ilich Kozlov. Aircraft is called *Melavika* (Little Owl) and is powered by a 700 hp Ivchenko engine. Range when used as an air ambulance is about 110 mi., but this drops to 140 mi. when used as a taxi, carrying three passengers and the pilot. All-weather flight capabilities will be studied.

"origin" and "destination." For example, what is a passenger's destination who visits 10 or more countries in Europe? What is his origin if he spends 45 days in Amsterdam after brief visits to several other European countries?

They also want to know what passengers their statistics will be put to by the U.S. They question the right of

Redefined by Congress

The Bermuda Agreement as a prototype for bilateral agreements has been endorsed by Congress. It is supported by U.S. carriers, and the State Department has never seen fit to recommend any substitute formula as a basis for bilateral air transport agreements.

In 1957, an attempt was made to amend the Civil Aeronautics Act of 1938 by adding the Bermuda capacity provisions to the Act as a means of gaining tighter control over Fifth Freedom traffic. The bill was never reported out of committee because the Senate International and Foreign Commerce Committee was convinced that other nations might be tempted to introduce similar legislation in retaliation.

The State Department, however, is now under pressure from the industry and the CAB to induce capacity checks and has already asked Belgium, Italy, The Netherlands and the Scandinavian countries to provide origin and destination statistics as a first step in the direction. Although the U.S. is the past or current with Berlin, to have international Civil Aviation Organization (ICAO) collect such statistics from all international airlines have not as yet been successful, although the program is under study.

Italy has agreed to provide the statistics, but The Netherlands, Belgium and Scandinavia are awaiting the request. They want clear definitions of

any country to ask that Sixth Freedom statistics be developed. Such information, they say, is outside the purview of bilateral agreements.

Sniffed Policy

In recent years, the U.S. has assumed a more coordinating role in the general traffic of negotiations with foreign nations on bilateral agreements. Breakdowns in recent talks (AW Jan. 13, p. 38) have been attributed to that switch to a stronger position in behalf of U.S. carriers, although a number of surface difficulties during that the U.S. give away so many routes to foreign carriers in the early postwar years that the U.S. is now on the begging rather than the doleful side.

Criticism of the so-called "go easy" policy of the U.S. reached a peak in 1955 when a series of routes into the U.S. were granted to Lufthansa. Since that time, the U.S. has gradually tightened its bargaining position under pressure from the CAB, the airlines and labor groups.

The new policy has resulted in increased conflict, particularly with The Netherlands, Italy and Argentina. The latest policy shift at ending capacity restrictions on Fifth Freedom traffic to the latter will undoubtedly spread this discontent to other nations.

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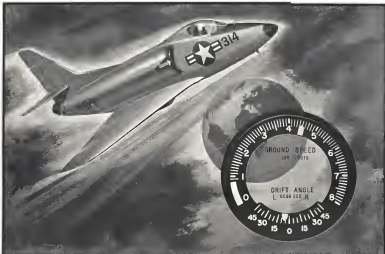
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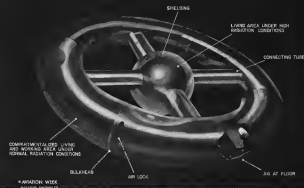
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AVIATION WEEK
MAY 1968, PAGE 18

MANNED VEHICLES operating for long periods in space probably will require heavy "storm shelters" to shield their crews from satellite atoms coming from the sun during solar flare disturbances. Vehicles with large internal volumes and big working spaces for their crews are planned for the third generation of manned space craft. Sheddling of the crews of these vehicles against most solid radiation is one of the greatest safety problems in space. "Storm shelters" with a small living space inside. Manoeuvre by satellites and balloons



AVIATION WEEK
MAY 1968, PAGE 18

One indicated that "storm shelters" would be required during the missions right to 30 times a year from bursts of high intensity radiation from the sun. These "shelters" would weigh at the neighborhood of 30,000 lb. for two or three men.

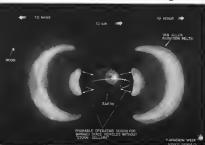
Space Stations Require Radical Design, Structures

By J. S. Bata, Jr.

Washington—Third generation manned space vehicles are scheduled to be refitted spaces and to operate for years without major repair. This means they will require design concepts and construction materials radically different from those used in the manned, short-lived Mercury vehicle and the second generation multistage capsules.

Internal working space of a 30,000 lb third generation vehicle will equal that of a small cottage, and light, low density structure must be used to enclose this volume if the structural weight is to be kept low. Current estimates are that accurate type structures and high density short-term materials will not be adequate for the pressure vessel construction of large space vehicles.

Development of new low density, high strength materials for primary vessel construction has become a major objective of the National Aeronautics and Space Administration (NASA) (July 21, p. 25). Composite materials using many types of synthetic rubber, plastic and ceramics as binders and fiber reinforcing types and waxes to provide high strength are being studied. A number of configurations of low density

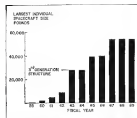


NATURE of the problem encountered in space is just beginning to be understood. If the level of background radiation beyond the Van Allen belts is too high, space travel there may be impossible until completely new shielding techniques and materials are developed. Current studies show the best solution is a manned space station in at an altitude of about 100 mi at the equator.

SPACE TECHNOLOGY



CYLINDER AND TORUS



FIRST of the third generation, large volume space vehicles can be launched on the shuttle class where if booster development programs do not slip. Early models of the third generation vehicles probably will not be manned. Spherical shaped pressure vessel (right) to carry the crew of a space vehicle is the lightest that can be built of short material. Cylindrical or torus-shaped vehicles of similar volume and material will weigh 15 times as much as the sphere. Many shapes are possible if composite materials reinforced with wires and filaments are used.



WHERE: W =STRUCTURAL WEIGHT OF VEHICLE
 V =INTERNAL VOLUME OF VEHICLE
 P =PRESSURE INSIDE VEHICLE
 σ =DENSITY OF STRUCTURAL MATERIAL
 σ =ALLOWABLE STRESS OF STRUCTURAL MATERIAL



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sheet metal sandwich are being investigated to determine just what type of core shape will best meet the penetration and point load attachment problems for space vehicles.

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The relative value of conserving are gained at payload weight for about 12 lb in total vehicle weight for an aircraft, approximately 100 lb of vehicle launch weight for a large missile and nearly 1,000 lb for a space vehicle which can reach the moon or the outer planets. The potential savings in total program cost through weight reduction in a space vehicle are believed to warrant the expense of overcoming the fabrication and workability problems of current beryllium alloys.

Design studies now in progress for the third generation of manned space vehicles are hampered because no clear understanding of the space environment is available and probable noise will be available until the first of these vehicles is in service. Primary environmental unknowns are the speed, frequency and rate of occurrence and the type and density of radiation in the region of space near the earth and in the solar system.

Thus basic solution now in orbit have provided much information on radiation and meteorites. The next important factor shown by the present information is that the quantity and type of both meteorites and radiation vary with time.

Meteorite dust and radiation "storms" are known to occur in space. It is uncertain today whether these are cyclic variations and follow some pattern which can be extrapolated to show what conditions a space vehicle will encounter during a given period, or whether the variations are random.

Safe solution is believed to be varying in an 11-year cycle, but the chances and magnitude of these cycles over a period of 10 to 100 years is not certain. It is clear that many more years of work will be required to get a detailed understanding of these problems.

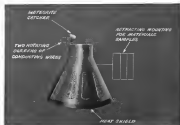
Even though the first mission to the radiation and meteorite questions are many years away, it has been possible to determine broad limits to this important factor of the space environment so that a reasonable preliminary design work can be done on the third generation of space vehicles.

Two areas in space are of immediate interest for these manned space vehicles, and two types of radiation problems will be the controlling factors in their design. The two areas in space are:

- Low altitude orbits near the center with a maximum altitude of 100 mi.
- Calcular space—the area between the earth and the moon.

The two types of radiation are:

- Background cosmic ray radiation, which occurs more or less constant



RECOVERABLE SATELLITES to test electronic, structural and welding systems in space are planned by NASA. Avionics Work station's construction shows retractable doors and extendable arms which will expose external components and structural supports to the space environment. Also represented is a completely test stand will be brought back behind the last shield and returned in earth without exposing the last of country on that change which occurred in space can be evaluated through close study. Throughout extending out of top of satellite is the earth small meteorites and being them back for study. The atmosphere would be filled with a low density material, and two rotating wire grids in front of it would be used to give a close approximation of the speed at which the satellite is intercepted.

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• **Bursts of high energy particle** produced by the sun during solar flares. It was determined from the data provided by the first satellites that most of the radiation trapped in the Van Allen belts around the earth has such a high energy level that it would be impossible for man to live in these areas for a long period even when protected by extremely heavy shielding.

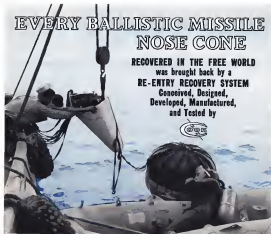
Particle energies in the inner Van Allen region have been estimated up to 200 mev, which would give an unshielded man his allowable weekly radiation dose in about one minute. Although particle energies in these belts vary considerably with time and position, satellite measurements to date have shown that they are so high that the shielding weight required for continuous manned flight in the Van Allen belts is not feasible in today's technology.

Additional solution below the inner Van Allen belt at altitudes of about 300 mi or less have been pointed to be completely safe for short-term manned flight. This is the area in which the Mercury capsule will orbit in three orbits. Radiation "storms" coming from the sun during solar flares will not be a problem with this type of flight because the capsule can completely cut off light and re-enter the atmosphere before high energy particles reach the earth even if a flare is observed during the launch.

Crew safety during long term orbiting of third generation space vehicles is

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that rigging is open to more questions. Current data indicates that the background radiation will not exceed the maximum dosage levels used by NASA in its studies. These limits, which are the standard used by the National Bureau of Standards, are 0.3 rem from gamma equivalent radiation per week, 5 rem per year and 25 rem total life.

Effect of solar flare radiation at all latitudes and altitudes has not been determined to date. Measurements made by balloons over the poles have shown that radiation bursts with doses up to 2 rem per hour have reached the vicinity of the earth following a solar flare.

Maximum intensity of these radiation bursts, or "solar" flares about one day, and they increase the radiation in a given area for about a week to 10 days. Frequency of these "solar" flares is approximately 10 per year at the present time.

Solar radiation "noise" approximately 1,000 times more intense than the noise described above have been observed five times in the last 20 years.

Some scientists believe there is a good chance that a manned space station orbiting 180 mi above the equator will be protected from all but the most severe solar radiation bursts by the Van Allen belts so that little or no shielding will be required to protect the crew. If future measurements show that this is not true and shielding is needed, the "moon orbit" approach is the most attractive means of providing it from a weight standpoint.

Stone Cellar

The stone cellar would be a small, heavily-walled sphere with a minimum living space inside to house the crew for several days after a solar flare. Since the radiation levels even in the Van Allen belts are well below the threshold of damage to most materials, the space station, its equipment and instrumentation will be undisturbed by any radiation near the earth and the moon, and only the crew will have to be shielded.

Weight estimates for spherical stone cellars are so high, however, that there is a serious doubt about the prospects of prolonged space travel by men in the foreseeable future. Studies by NASA contractors show that it will require at least a 16,000 lb stone cellar to reduce the radiation from the most frequent type of ultrashort long-wave solar flare to a safe level for humans. Such a stone cellar would have a spherical living space with approximately 4 ft radius. It would be quite an engineering accomplishment to provide this cellar with a lift support system and external storage tanks to keep two or three men alive for a week or more during a radiation storm.

The great weight of the stone cellar

would dictate that it serve no more function as possible as air space vehicle which requires it. Depending on the specific vehicle design, the cellar could double as a re-entry capsule and/or as a waste structural element supporting dynamic, vibration equipment.

NASA studies have shown that cellars with thick carbon with lead as shields will lead an effective radiation attenuation for their weight. Carbon stops the high energy solar proton and cosmic rays, and the lead stops the secondary radiation consisting from nuclear reactions between the carbon and protons. The heavy carbon walls are also a fire hazard and the cellar must also serve as a toxicity capsule.

Radiation Hazards

Shore offers several key human protection in the lower Van Allen belt and during a major solar radiation burst would avoid the cellar described above. It will not be possible to consider landing vehicles with such components into space until very large data records are available. The most encouraging aspect of the radiation picture is the fact that the present data is incomplete and an ever closer examination. Most experts in the field believe that the current estimates of radiation levels in space will change considerably as more measurements are made. Three years is by no means, however, is to whether the

change will be favorable for manned space flight.

The uncertainty of radiation conditions increases considerably beyond the Van Allen belts. Data returned from the moon by satellites orbiting by several miles of altitude, measuring the level of background radiation. These interpretations of this data are that an unshielded man would get his yearly radiation dose in two to three weeks, and others show that during an exposure of a year the man would contract only one half of the disease dose.

Protonistic View

If the protonistic view proves correct, the total radiation level during a major solar flare would place the vehicle design and propulsion problems beyond present knowledge and resources. Establishing the feasibility of manned flight in the moon within the next couple of decades appears to depend on a more definite knowledge of this item, better shielding materials, and design and an accurate method of predicting solar flares.

Information on the occurrence of meteorites in space is sketchy but based on data from a number of sources, NASA's Langley Research Center has estimated that a 40 ft diameter, 100-ton shaped space station in a low orbit around the earth would be struck at the rate of about once a century. The

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Power Unit Would Generate 300 kw. for Year

Two-loop nuclear space power systems using a sustained open Rankine cycle with output of 300 kw for one year is shown in General Corp. sketch. Radiator encloses a nuclear heat source, turbine and generator. System is being developed as part of Project Sero, which is under sponsorship of WARD and the Atomic Energy Commission. Estimated output is expected to reach 1 megawatt.

Units would average one-inch-thick radii in diameter.

Theories on the effect of these particulates of a space vehicle's structural materials can indicate. One idea is that at very high impact velocities, a small object will hit with explosive force and make a crater and cause damage similar to that inflicted by a much larger object traveling at a much slower speed. Get astrophysical failure of structural vessels is known to have been caused by high speed particles. Other concepts merit their share in the rate of the space vehicle and some of the materials being considered for its structure.

Reusable Differences

It appears to be impossible to reconcile these theoretical differences without improved experimental facilities on the ground or specially constructed satellites. Current high speed "guns" used for the work are limited to a speed of about 20,000 ft/sec, which is apparent inside the speed of sound in most of the materials of interest. It is believed that the character of entering and impact changes radically when the impact velocity exceeds the speed of sound in the material.

NASA's Research Advisory Committee on Structural Design has given a high priority to the development of an improved high-velocity "gun" and to

the launching of a satellite which will catch some satellites and return them to earth to their coast companion can be determined. These activities are believed to be essential to the development of reliable self-repairing and self-repairing space vehicle structure.

Terror Environment

Self-repairing radiation and antiradiation for the most serious of the space environment, but there are other factors which will require extensive study and experimentation before they can be described properly in a detailed engineering specification. These factors include:

- **Hard vacuum**, which has a little understood deteriorating effect on the surface of most materials. In combination with certain types of radiation, a softening takes place on the surface of many metals that could not be seen. When placed in contact in a hard vacuum, other metals will become welded together. Thermal radiation across space is markedly different in a vacuum from what it is in the atmosphere since the thermal stresses in structure. It is a major problem, probably, will be increased in space because the damping action of the atmosphere will be absent to control vibration.
- **Thermal radiation** which will be experienced by a space vehicle is not well understood, even though the character

Sputnik Rocket Down

Washington—Final stage of the rocket vehicle that launched Sputnik IV into orbit last May 15 burned up in the earth's atmosphere over the Pacific Ocean on July 17, Moscow Space News Service Central Control reported.

Sputnik IV itself and seven other objects still are in earth orbit, ranging from 115 to 1187 mi above the Earth, in an orbit and perigee ranging from 1712 mi to 1171 mi. Period range from 91.9 min to 94.9 min. The satellite apparently broke in parts when it was fired to separate the other from an unbalanced spin position (AW May 19 p. 35).

and intensity of solar electromagnetic radiation has been clearly established. The heating of a space vehicle will depend largely upon the solar radiation, but the effects of galactic radiation and the ionized energy from the earth will also have an effect on the space vehicle's atmosphere and skin. Factors currently are not well understood today.

- **Magnetic fields**, atmosphere and radiation fields surrounding other planets will have to be studied in detail before man can hope to travel in them.
- **Thermal radiation** which will be experienced by a space vehicle is not well understood, even though the character

Short Range Goal

One of the major short range goals of NASA is to completely define the environment of the earth and of space between the earth and Mars and Venus. This is being done presently through the research satellite program and by placing instrumentation in payload balloons in every period that a test area space test can accommodate a few years' period.

Some aspects of third generation space vehicle designs are clear, even though their environment and design requirements are not fully known. One of the main features of these vehicles (from a structural engineer's point of view) is that they have to satisfy aerodynamic requirements for reentry in short period in their life. The vehicles must withstand high aerodynamic forces and dynamic loads during launch, and there is no end answer to this requirement except to build a dense, small frontal area structure which will not generate much lift. After this period, however, when the vehicle is in space, the structural engineer has an unlimited freedom to shape it as he pleases and to arrange the heavy equipment in the vehicle so that he makes the best use of space and construction materials. From the

work being done at present it appears that the likelihood for the structure must meet that third generation, large volume space structure will be lighter and lighter, at comparison with modern aircraft.

The conflicting requirements of launch and during operation in space have left such few alternatives to the space vehicle designer. They are to use:

- **Ballastable or collapsible structures** which can be expanded into a small volume during launch and then expanded in the vacuum of space.
- **Modular construction** so that a vehicle could be sent into space in many sections and assembled in orbit. Booster preparation tools have been suggested in building blocks for such vehicles.

Robbing Attractiveness

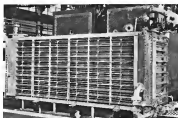
Robbing attractiveness of these approaches depends to a large extent on lower reliability and size. Current space seems to be leading toward collapsible structures because a booster capable enough to carry even a small satellite enough to risk a huge expense

space vehicle. As booster payload capability reaches 15 tons and more, it becomes possible to think of sending complete space vehicles up in a single flight.

Construction Approaches

Importance of saving structural weight on space vehicles and the lack of avoidance measures, probably will result in the use of simple geometric shapes. A sphere is the most efficient shape from the weight standpoint for a pressure vessel of given volume, construction material and internal pressure. A cylinder at least is 1.5 times heavier than the sphere, and the weight goes up in the geometry is changed to accommodate an axial vehicle design requirements.

If space vehicles are made of the high density materials common to aircraft, there will be a large weight penalty of the basic construction mentioned above are modified seriously. However, the broad range of work with new structural materials and new thinking on the part of structural engineers has opened many



Portable Nuclear Powerplant Condenser Tested

Equipment for a prototype model of a portable nuclear powerplant is being built by Westinghouse Electric Corp. The nuclear powerplant is being developed by the Martin Co. Nuclear Division for Atomic Energy Commission. Photo shows a test model of a condenser in evaluation. It is 1 ft. x 1 ft. x 12 ft. long. Westinghouse has completed a feasibility study of a steam generator and secondary loop for the powerplant, and now is building the condenser, steam generator, nuclear generator and moderator. The Martin powerplant is designed for use at remote military installations. The condenser has operating pressures from -60 to +125 psi. The three phase, three-wire system, which will power sensitive electronic equipment, will develop a 100 v. system $\pm 0.5\%$ variation and $\pm 0.25\%$ frequency fluctuation under steady-state conditions. The system can be paralleled in pairs for possible electrical purposes.



Snark Fired From Mobile Launcher

USAF Northrop Snark infrared-guided missile is fired from its mobile launcher at Cape Canaveral Missile Test Annex, Fla. Ejectum from the condensed 360,000 lb. thrust of the booster rockets is deflected away from the launcher towing vehicle by curved rocket nozzles.



Chamber to Simulate Hypersonic Flight Environment

Environmental chamber for hypersonic research being built by Boeing Allynage Co. will simulate the heat, light, vibration, temperature and humidity stresses changes, and changes in the composition of gases which are expected to be encountered in hypersonic flight. Subject at left is about to be lifted into a small weight chamber within a larger chamber. It will be given tests in spinning trips on roller screens, heating, simulated conditions.

new possibilities in space vehicle design.

One of these new ideas concerns "automated" structures which require the use of material that is stressed in only one direction. With present solid type pressure vessel construction, the structural construction is a compromise because the material should be stressed equally in two directions so it is in a sphere to get maximum efficiency.

New Materials

New composite materials which act as a load in only one direction have made the structural structure attractive. These materials have a low strength binder material reinforced with thin wires, whiskers and flat foils. Very thin glass, metal elements a few microns in diameter or thickness have been found to have several times the allowable stress as the same metal rolled into the usual structural sheet. Objective with the

Structural specialists at NASA and elsewhere expect that the most important advances in space vehicle construction will come through judicious combinations of new materials and new design concepts. This has proven true in many instances other than automated pressure vessel design. Some of the urgent problems which are being attacked through close cooperation by structures and materials engineers are the following:

- Development of improved structural and moisture materials and design for cryogenic tanks
- Development of methods for attaching great loads to large vehicles, thin wall pressure vessels
- Development of new configurations of low density materials structural made from commercially available pipes of sheet metal
- Development of improved means of stopping tanks in thin pipe pressure vessels
- Development of multi-walled pressure vessels capable of withstanding very high speed impact from small projectiles

Japanese Launch First Kappa Rocket

Tokyo—First Kappa No. 3 two-stage rocket, carrying a 22 lb payload, was successfully launched last month by Tokyo University's Institute of Industrial Science at Mutsuwa Beach, about 100 mi. northeast of here.

The 11 m. rocket, weighing about 1,000 lb., reached an altitude of nearly 70 m. Instruments furnished information on first-stage temperature and operation of the rocket's fuel line. Payload placed reached about 25,000 ft. thrust.

The firing marked the first time a Japanese rocket reached the atmosphere after 68 similar tests since July, 1957, at one of Japan's International Geophysical Year projects. Second Kappa No. 6 flight will measure electron density in the ionosphere.

Hypervelocity Tunnel To Test Dyna-Soar

South-A hypervelocity wind tunnel scheduled to participate heavily in the development of Boeing's Dyna-Soar manned space glider and McDonnell DC-24 program has begun operation here.

Operating at the speed ranges from Mach 10 to Mach 27, at temperatures up to 14,000°F and weighing about 100,000 lb., the structure of the tunnel are designed with wind tunnel to provide a research capability in regions of space vehicle orbital speeds.

The 50-ft. tunnel test tube makes



BEING HOTTEST hypervelocity wind tunnel has two large circular windows on either side of its 44-in. test section. Unlike test tube a shot of about 3-in. diameter.

test section measures 44 in. in diameter.

A cooled and air-filled space adjusts the tunnel, whose ductwork pumps for delivering an impulse equivalent to 5 million lb. is built up and stored as 2,250 operations. Control cables link such operation to a collector wheel to bring individual changes into a single conductor leading from the zone into an air chamber at the optimum end of the tunnel.

The stainless steel air chamber is



Space Particle Studies

Duany, Cold—A hypervelocity impact gun has been developed by Aero-Space Laboratories of North American Aviation's Missile Division to propel particles at a speed of 30,000 ft. per second participating in the program into that only 197 of the available energy of the system has been utilized and that greater speeds will be achieved when full available energies of the gun are used.

These experiments are being conducted under an Air Force Office contract. Purpose of the program is to determine the effect of micrometeorite particle impact on spacecraft and orbiters, and to learn what metal can be used most effectively for those of these vehicles (AVR 14, p. 25).

MACH 14 nozzle structure looks simply in test and gives whole test room pressure and heat transfer collector model.

variable in use by use of nozzle plugs. Press to a tunnel run, the chamber is changed with an outer pressure to 2,000 psi, while the pressure in the test section is pumped down almost to a vacuum. The test section and the arc chamber are separated by a tungsten anode. Much noise of the test is controlled by varying the size of the nozzle opening, which ranges from 1/16-in. to 1/4-in. A thin plastic diaphragm between the nozzle and arc chamber maintains pressure differential between the arc chamber and the tunnel.



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BOAC has followed its contract for 35 Vickers VC 10 jetliners by ordering from British Aircraft Corporation ten Super VC 10's—aircraft which are tailor made for high density routes such as the North Atlantic.

In an economy class layout the Super VC 10 can carry up to 232 passengers plus 4 tons of freight non-stop from London to New York against strong headwinds.

Both Vickers VC 10 and Super VC 10 with their new look clean wings and rear-mounted engines will offer an air field performance and a cabin comfort which will make them the most passenger preferred long haul jets in operation.



MISSILE ENGINEERING



First Firing of Mace From Hardened Shelter

USAF's Mace TM-78B Mace nuclear missile is launched from hardened underground hard site at Cape Canaveral, Fla., in the first test of the concrete shelter and the first test to use production-type ground support equipment. In field use, launchers will be below ground, multiple-well installations. Mace was fired after a "hot load," in which most of the extensive checkout and checkout procedures are completed and made to hold in a ready condition, with only a hot load event needed for rapid reaction.

Mace is already painted and is designed to remain in hot holds for as much as several days. New integrated missile checkout system, designed by Martin, was used. Prototype site at Canaveral is equipped to fire two missiles. Launching was the 14th for Mace B and the eighth since test program moved to Florida from Holloman AFB, N. M.



Robot Designed For Missile Retrieval

Washington-Vetus Laboratories is assembling a Solovis underwater robot system designed for remote retrieval and ocean research. The system is scheduled for delivery to the Navy in October.

Initial Solovis trials will be used to retrieve torpedoes at the Kujat, Wash., test range, but Vetus sees the greater potential in the system in salvage of spent ordnance ranging for reuse and recovery of war zones. Solovis can pick up 8,000 lb and perform a variety of salvage and observation missions.

Vetus now is assembling Solovis under a \$140,000 contract awarded last September. Complete system weighs 500 lb and will hold under a surface ship at depths to 2,000 ft. Supported by half-track vehicle, it will use 25 hp ship's generator to power its video camera, sonar and electric motor. Control console on the ship has television camera, depth and direction indicators.

Navy version will use primitive, also computerized, by console operator. The working arrangement could be replaced by cable class, steel gun, explosive magnetic charge, impact, pressure or acoustic traps.

Deep vision camera is mounted in a pressurized housing surrounded by an array of three 500-watt lamps. In clear water, the camera can discern structure visible at 50 ft. In poor visibility, a target will be located by high resolution, line focussing system on camera face probe.

Three foot optical camera chain focuses a 50 ft. wide, 16 ft. subtended camera viewing two variable pitch propellers through a gear train. Screw pitch can be varied to provide a thrust range from 115 lb positive to 300 lb negative. While propellers are closed at constant 4.0 rpm, pitch variations permit the vehicle to go forward at 1.7 ft., hover or back between a 40 ft. to high 50 ft. wide all and 60 ft. long.

In addition to gunner, water mine and torpedo salvage, Vetus uses Solovis can be used to retrieve underwater cables and sample ocean bottom.

Although the reusable launchers launched from Atlantic Missile Range have empty case weights exceeding Solovis' 400 capacity by a ton, Vetus says salvaging capacity is not limited by any difficult physical problems.

Convair Given Additional Contract for Army Mauler

Convair Division of General Dynamics has received an additional contract for \$5,176,000 from the Army for continued development of the Mauler battlefield air defense missile system. Work on the program is being done at Convair's Pomona Division.

Steering gears in this 12" C. D. (dia-section) Perkins Drive Gear are machined before assembling and hardening. Each splined all gear such are ground and held to .001" concentricity after hardening the entire gear.

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Most machining operations on this Drive Gear (left) are performed after heat-treating has been completed in the heat-treated area at Rockwell C42. External splines and gear teeth are ground with splines held to precision tolerances.



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Concrete Cover Aids Radiation Tests

Mobile concrete lab weighing 1,300,000 lb. helps to speed radiation efforts tests in a pile of nuclear wastes at Clinton Division of General Dynamics Corp., Ft. Worth, Tex. The cover prevents gamma rays and neutrons produced in the underground reactor from escaping into the atmosphere.

Gulfstream Cleared For Weight Increase

New York-Gulfstream Aircraft Engineering Corp. has notified Federal Aviation Agency crews for increasing allowable gross weight to its Gulfstream twin turboprop executive aircraft by 1,500 lb.

Gulfstream owners, Grassman reports, may begin operating the transport at 35,100 lb., instead of the present 33,600 lb., "late this summer." Replacement of its landing gear as the plane's loading gear is the only modification required.

The inland weight increase will be accompanied by a 1,000 lb. boost in the Gulfstream's maximum landing weight, which will rise from 32,300 to 33,300 lb. Zero fuel weight of 21,500 lb. will remain unchanged.

The plane's maximum payload of 4,575 lb. (the difference between maximum zero fuel weight and operating weight) will be increased to 6,670 lb.

Gulfstream also may offer installation of two 150 gal. disposable fuel tanks onboard of the Gulfstream's model 37. The modification, which would give the transport a "segmental" capability, will be installed only if purchaser agrees it, Grassman said.

As of July 1, of the 46 Gulfstreams delivered by Grassman, 37 had been placed in operation by their purchasers.

The higher gross weight rating is of major significance to Gulfstream owners because it doubles the plane's passenger carrying capacity on long-range missions. Operating under the original gross weight, the Gulfstream, with a full fuel load of about 10,100 lb., had a top payload of approximately 1,700 lb.

This equaled about six passengers,



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Sabena's First Caravelle VI Assembled

First of Sabena's first Caravelle VI, seen in the workshops of first Aviation at Toulouse-M. Marais, is assembled in three sections. Sabena has ordered four of the 70 passenger jet with which it will operate at 500 km/hr.

average an average passenger weight of 165 lb. plus 10 lb. of baggage. At its new gross weight, the Goldstream can carry full fuel and up to 12 passengers, depending upon the interior configuration of the aircraft.

According to Gramercy, the average first configuration provides seats for about 10 passengers while the average Goldstream flight carries 5-5 passengers.

PRODUCTION BRIEFING

Copier Division of General Dynamics, Fort Worth, Tex., manufacturing a program to produce a total of 155 airplanes to replace their own companies, then expediting shipments. The contract award, based on proven quality standard, will go first to Industrial Products Division of ITT, San Francisco, Calif., and then to Boeing, North Hollywood, Calif.

Schweitzer Aircraft, Stratford, Conn., will receive 30 A-10 II helicopters under 55.5 million contract from the Army Transportation Material Command. Overhaul of the helicopter helicopters includes installing automatic distribution equipment and upgrading its automatic efficiency.

Delta Corp., Norwood, N. J., will produce two Delta model flight simulators for the Navy under \$145,000 contract. The second, the second and third, produced by the Navy, will be attached to jet engine test simulators at Corpus Christi and Massana, Calif., Naval Air Station.

Intelligence of the Acoustical Sciences (division) has voted to drop "Acoustics" in the title and substitute "Acoustic" pending membership approval.

Locking fuel injection engine for use in the Aero Commander 500B is certified under designated 10-190 (AWA 11, p. 119) has been certified at 290 hp. by Federal Aviation Agency. Commander Model 500A is powered by two 250 hp. 183-071 piston engines (see p. 148). New engine is a direct drive, air-cooled model, now joins will have a ground and a supercharged version available soon.

Royal Air Force has ordered 20 additional Armstrong Whitworth AW 660 transport aircraft, making a total of 40 (AW 11, p. 119, p. 17). **Protonique** AW 660-1000, version of the Argosy—expected to make its first flight later this month. Armstrong Whitworth also confirmed that Roddy Airlines will take delivery of the Argosy to start flights in July next year. Although the contract has not yet been signed. These aircraft will be used to build Roddy's part of the Logan contract (AW 11, p. 46). Loading system and other arrangements are under negotiation.

California Institute of Technology's Jet Propulsion Laboratory has closed its shop facilities at White Sands Missile Range, N. M. The 19 people employed by JPL at the range have been loaned to JPL in Pasadena or to the JPL facility at Alamogordo Range, Cape Canaveral, Fla.



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WADD Avionics Division Aims at Space

- 35%: Navigation & Guidance Laboratory
- 30%: Reentry Laboratory
- 20%: Electronic Technology Laboratory
- 15%: Communications Laboratory

There is less enthusiasm over the reorganization in some of the effect life outposts. For instance, there is concern that reconnaissance missions may suffer as priority and emphasis because of the new setup. Because Air Force has no vehicles, except for the Saturn

Until several years ago it was relatively rare to suboptimize from ground hardware and developments to future needs because only vehicle speeds and altitudes changed with time. The days of the war are changed all of this.

The bulk of this Laboratory's efforts are aimed at space applications, except in the field of electronic counter measures where it will support applied research for submarine vessels.

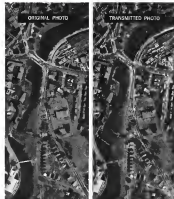
For example, super-*chiff* is extended to produce advanced detection with greater sensitivity out at the longer infrared wavelengths (about 30 microns), where relatively cold objects have their peak infrared radiation, for use in detecting objects in space. Ultra-*chiff* de-

which can be folded during launch and unfurled once vehicle is in orbit. Other antenna research aims include designs for use in hypersonic-type vehicles where antennas and radome form an integral part of the vehicle structure and which employ electronic scanning, <http://bit.ly/1802024>.

Fiscal 1961 funds will be used in part to support development of additional cyclohexane functional electronic blocks, called FEH's (pronounced "foe"), beyond those under development by Westinghouse and Texas Instruments under WAFD sponsorship. Laboratories also plan to test funds set



Wang's first secret weapon, for electromagnetic interference, is a new design under evaluation by engineers of International Telephone & Telegraph Corp. about the Air Force T206. Wang's battery usually will last 360 days, according to him, without blind spots.



CBS LABORATORIES PHOTOSCAN SYSTEM

Progressive, a radical advance in aerial reconnaissance technique, makes it possible to transmit visual information from aerial or unmanned aircraft to ground receivers in seconds, without loss of detail.

The high performance of CBS Laboratories' Photoscan is illustrated above. On the left is an enlarged portion of the original aerial photo which covers an area of nearly four square miles. On the right is a portion of the transmitted picture after transmission through the Photoscan System.

Challenging error opportunities are available at CBS Laboratories on language systems development programs such as: Phonetics. Positions for physicists and electrical engineers are now open in the following departments: Military and Industrial Systems, Acoustics and Magnetism, Solid State Physics, and Vacuum Tube Physics.

Please forward resumes in complete confidence, or obtain additional information by contacting CBS Laboratories.

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For an outline to CBS LABORATORIES South see 1964-1965 WOODS, Inc. 1964, Inc. 1964

the development of techniques for transmitting individual PEBE. With-out a comparable communications technique, much of the size and weight saving of multiterminal construction is lost.

Laboratory has study contracts now in the field of human. Fred 1961 funds probably will be used to further studies aimed at obtaining usefulness of exposures which describe the operation of various animal functions, then attempting to translate them into electronic equivalents, according to H. V. Noble, technical director of the laboratory.

Becoming of the close interrelation of computer logic design and the capabilities of the basic elements used in the construction of a computer, the Electronic Technology Laboratory is expanding its efforts to include applied research in basic computer components and circuit logic, according to Carl Schuler.

Another laboratory area now is being research into plasma and its connection with radio frequency energy aimed at developing high power generators for microwave waves. Laboratory also plans to carry out investigations in vacuum diodes and electronic applications for new materials. Radioactive waste disposal system is planned for conventional component research because of extremely complex features required for component construction.

Communications Laboratory

The responsibilities of the Communications Laboratory, headed by Carl J. B. Rogers, encompass reflective ground, vehicle-to-vehicle, and internal vehicle communications, as well as all-weather telemetry techniques. One of the more recent programs now under way is to explore the use of modulated light for communication between vehicle and the vehicle-to-ground use (NAV Dec. 14, 1958, p. 47).

There will be continued effort during the coming year as speech compression to reduce the power/bandwidth required for aircraft voice communications. This is particularly important for space vehicle use where such bandwidth is available. Laboratory program also will use an improved sensitive sensitivity and lower noise figures.

Progress in microwave techniques which will enable an increase in bandwidth, treatment on a number of different frequencies is in progress for Fred 1961, according to Lt. Col. Robert A. McIlhenny, assistant chief of the Laboratory. Communications Laboratory also has program to develop multi-band radio interference measurement system which will permit direct communication between two members of an aircraft carrier's electronic warfare capability of present radar systems.

1961 FILTER CENTER 32222

► **Transistor Boom May Be Foreshadowed** in the word suggest that semiconductor industry may be approaching doldrums period which will then rise. One indication is the risk of price cutting in transistors. Another is the fact that transistor sales for April were up only 68% over previous year. This is a respectable increase but for the fact that the semiconductor industry will have been doubling each year. Situation results from influx of many new companies into the field, many facilities expansion by older manufacturers and the fact that down the line Department defense are going into large-scale production programs. Japanese semiconductor industry also is possibly in upward over growing concerns of transistors.

► **Melpac to Study Microelectronic Techniques** Melpac will study various systems equipment to determine future requirements for microelectronic development under Wright Air Development Division contract. Company will study ex-

isting and proposed equipment to determine frequency, distribution, simulation and characteristics of equipment and current functions.

► **Electronic Noise Navigation Studies**—Electra Knight Corp., East Norwalk, Conn., will measure spectral characteristics of 24 line antennas line radiators from plastic radio sources to achieve the possible use for space navigation and guidance under \$31,000 contract from Wright Air Development Division.

► **GE Designs Welded-Wire Matrix Mechanism**—General Electric, Schenectady, N.Y., will design a welded-wire matrix mechanism (NAV Aug. 24, 1959, p. 104), under contract of a tape program prepared automatically by computer, it being developed by General Electric's Light Military Electronics Department. The mechanism, slated to be ready in September, will be able to produce 10 ft. of welded wire matrix ribbon per hour. Using computers to design system matrix layout, and machines to produce it, GE estimates that it will eventually be able to produce a welded-wire matrix ribbon 20 times faster than current design has been made. Late tests on a welded wire matrix ribbon.



Librascope Develops New Potting Technique

New potting and protection coating technique for computer computer microcircuits, developed by Librascope Electronics of Great Barrington, Mass., are shown being applied to the printed circuit boards, called "logic cards," which comprise the intelligence of electronic digital computers. Process protects against humidity, contamination, shock, vibration

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PROBLEMATICAL RECREATIONS 25



1. makes 5 turns while B makes 2, 2 makes 4, while 1. makes 3. Five turns of A's weight are of B's, 5 of A's weight 3 of B's. One of B's is as much as 4 of A's, and one of A's as much as 1 of B's. Which is best against weight is the result of equality of work, lightness, and weight?

— Charles Kewley Outman

Among the products of our Maryland Division are telemetry systems. For the record, a Maryland Division telemetry system was used to track the first missile nose cone that successfully re-entered earth's atmosphere.

ANSWER TO LAST WEEK'S PROBLEM: He lost, even if they played only twice, at four times, or six, or ...



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Beverly Hills, California

New Simulator

Radio transmitter and display simulator, developed by Electronic Research, 56, Loma Boulevard, 30, St. Louis target at 300 ft. with 45 x 70 degree coverage in pulse operation at 180 cps, either target with continuous coverage for CW operation. Complete performance is visible at other bands. Besides also provides simulated display output, with frequency shift of 20 cps to over 1,000 kc. Bandwidth is ± 10 ms. from center, with tuning over a 20% band.

containing 25,000 welded joints and 5,000 soldered joints, subjected to continuous vibration and thermal cycling, represented with a single joint failure in 600 hr. of testing, company reports.

► Computer Does Double Duty—Digital computer developed by North American's Automation Division for airborne guidance of the GAM-77 (Hound Dog) air-to-surface missile, will also be used as the ground for automatic collection and checkout of the missile's entire internal auto-sequencer.

► AEE Goes Into Orbit—Four days of industrial seminar dealing with space technology, with particular emphasis on motor power sources and electric propulsion systems, will be a feature of the Pacific General Meeting of American Institute of Electrical Engineers. Sponsored are sponsored by the Aero Space Transportation Committee of the AEE.

► How to Keep Cool—"Handbook of Methods of Cooling Air Force General Electronic Equipment" is title of new 608-page report prepared by General Atmospheric Laboratories under Research Development Center operations. Corp., identified PB-161264, can be obtained for \$6 from Office of Technical Services, Commerce Dept., Washington 25, D. C.

► Signal On the Dotted Line—Major contract awards recently announced by in major manufacturers include the following:

- Collins Radio, Cedar Rapids, \$12 million, Air Force contract for solid state single channel radio commensurate equipment for Strategic Air Command.
- McGraw, Inc., Alexandria, Va., will produce target detecting device for

Navy Bureau of Weapons under \$1.6 million contract. Company also reports contract to develop warning and detection systems for Army Chevrolet Center.

NEW AVIONIC PRODUCTS

► Transducer, Model 10R-60-1 and 10R-10-1, offer 0.2 x mV/deg and 0.5 x mV/deg sensitivity, respectively. They are cylindrical units, 1.25 in. high and 0.937 in. in diameter. These transducers are available with a.c. input and a.c. or d.c. output. Typical specs for two 10R transducers are as follows:



transducer has input range— ± 50 deg and ± 40 deg; output voltage—16 x ± 0.400 v; output impedance—1,600 ohms; independent linearity— $\pm 0.5\%$; self-heating—0.1% of full scale; full frequency range—3 to 10,000 cps. Arizona Corp., 11824 W. Washington Blvd., Los Angeles 66, Calif.

► Radiotelecommunications which occupy 0.57 sq. in. and weigh only nine grams have been designed for digital computer applications and are available in three 3/4 in. base packages. Frequency response of units ranges from 0 to 30 cps and operates from 17 x supply. Multichannel unit operates automatically over ± 5 to 100 cps. Cambridge Thermoelectric Corp., 441 Concord Ave., Cambridge 38, Mass.

► Thermal diode price/performance capabilities as engineers to select thermal diodes with peak, constant, peak, constant, rise and peak to valley, ratio to duty and from these selections obtain determination of peak for diodes for specific duty. Space Research Division, Space Research Corp., North Norwalk, Conn.

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Marquardt Plans to Diversify to Survive

By Michael Yaffe

Columbus, Ohio-based with the space program, Marquardt Corp. is fighting its corporate survival by aggressive moves into the electronics and space fields to ride out the crisis years.

This is the view of Roy E. Marquardt, corporate president, who told Aviation Week his company has a number of promising projects under study but added "the big question is whether there will be time to bring them to fruition."

The alternative, which Marquardt apparently is attempting to avoid as long as possible, is selling the company to one of the defense or aerospace firms that have been looking for its electronic core.

Marquardt took an optimistic view of the company's future prospects during the next decade and beyond. He discussed such things as the company's layout (AW Aug. 18, 1979, p. 19), its portfolio as a large space booster and as a main subcontractor for a new defense anti-ICBM missile, and the company's new nitrogen-bearing rocket that might be developed for use as Mars.

In a discussion of Marquardt's present plans and problems, Marquardt said that next few years adversely are going to be critical ones to the life of the corporation.

Basically, Marquardt's problems are in the same core that has been plaguing the company almost from its inception, that of filling an ever-widening gap left by the cancellation in completion of the company's major project—the Boman missile engine. Starting off in a small size, Marquardt has been at times severely curtailed in a two-pronged competition: on the one hand, Marquardt's prime program has failed, its place has been taken by a somewhat bigger program.

Diversification Moves

At the same time, the potential of financial disaster has loomed ever larger and more threatening if that gap was not filled. Too, as the number of government projects grows smaller and each program becomes individually larger and more complex, it is more difficult for a comparatively small independent company such as Marquardt to get out of them. Given the time, Marquardt hopes to complete this situation by further diversification into the elec-

tronics and the consumer market.

At the heart of Marquardt's current difficulties is the pending loss of the Boman engine program which is scheduled to end production in the second half of 1982. This has been and still is the company's most important project. This year, Marquardt's Glynis, Utah, plant has engaged in a major changeover effort, placing out production of the Boman-A model and placing in the B model, and so has included taking on new new business. The company also has been heavily occupied with the development of an advanced, low-costed Boman-B for this work is now being completed and, at least in some aspects, that will be an even Boman-B also 1982.

As for the troubles associated with the Boman-B as the sole part of its flight evolution program, Marquardt admits little fault responsibility. At least this is the view of Roy E. Marquardt who says he believes in the vehicle's recent production system, Marquardt said. Marquardt also conferred recently with North American Aviation's Columbus Division as the rocket engine it will be making for NASA's new Redstone (high altitude) and Redstone (deep altitude) designs (AW Feb. 4, p. 17). The new engine project will be based on both versions of the engine. It will be a new engine, considerably smaller than the Boman powerplants. Marquardt considers it a good program but not big enough, in itself, to fill the void left by the Boman project.

Electronic Ventures

Marquardt's venture into electronics now is beginning to pay off and may help carry the company over the next few critical years. This year, electronics will account for an estimated 10% of sales, but next year's estimate is as high as 20% if we go to the next year.

When the company bought American Machine and Foundry's missile computer activity a year and a half ago, it was being money, according to Marquardt. The company continued a particularly heavy loss to the development of the T-4 missile for air to air. However, the trouble now is behind it. Marquardt said, and the company has just secured a major new contract for production to true aircraft personnel in the industry of Marquardt and QinetiQ. There also are two other major

trading companies proposed that the company hopes to obtain in the next month or two.

For the commercial market, Marquardt is doing a variety of work on a construction and test equipment. Most of this work, however, is still in the development stage. The only equipment of the company is currently selling one is a high temperature antenna test unit. But even taken as a whole, Marquardt considers the potential of the company's recent electronic activities comparatively

The projects with real potential, as far as Marquardt is concerned are Shiva and Pluto (AW June 20, p. 20). If these projects were to lead to a major new program, it would amount to a lot more than a contract for the service and a replacement for Boman. The nuclear-powered rocket still presents some, but not insurmountable, development problems, including materials and Marquardt. But it is a candidate that will be decisive.

Rocket Range

The nuclear-powered rocket engine, Marquardt believes, is potentially an alternative way of propelling a vehicle with a heavy payload at high supersonic speeds and low altitude. It holds the promise of adding range, maneuverability and the possibility of refueling. In combination with an ICBM boost, he says, it makes a good defense system that could force the enemy into an expensive and costly development of new electronic systems. Based on the company's data, Marquardt sees the possibility of transporting cargo by nuclear rocket. The transportation of humans by this means does not appear as attractive due to the shielding problems, which would be approximately the size as these anticipated in a nuclear-powered rocket.

For the past few years, Marquardt has been working with Air Force contract support on the development of large space boosters. Of the several approaches to the problem now under study, the company will talk only about the hypersonic. Reentry is a performance of the rocket cycle, the hypersonic is a rocket engine that can be closed off at the end to function as a rocket when required. Originally, it was considered as a powerplant for an advanced Boman-B, but would not have to use boosters to get off the ground. For this reason among others, it has also been suggested for use in a supersonic transport. Its large space booster applications for

such missions as airship up manned space stations, according to Marquardt calculations, over the first retroactively passive launchers will use up to 50% of the most new estimated for these boosters. More sophisticated boosters might use up to 50% of the estimated costs. The advantage of the hypersonic as a powerplant for an anti-ICBM missile lies in its current cruise capability. Combined with an adequate early warning capability, it is suggested, this would enable the missile to cruise out to the area of anticipated ICBM penetration where it would encounter a rocket plane in its attack. Some of these concepts reportedly have used the hypersonic engine as the basis for proposals for new defense anti-ICBM missiles to supplement the point defense Nike Zeus.

Hybrid Engine

On its own, Marquardt is working on the development of a hybrid (solid fuel) liquid oxidant rocket engine primarily for ballistic missile boost applications. Great Central Rocket is supplying the solid fuel grain for this work. Company work to date indicates that such an engine will offer significant advantages at least equivalent to liquid oxygen/JP combinations, up to 300% efficiency, stable combustion and good mass characteristics (mass fuel and oxidant are stored separately).

Another Marquardt project is FET-C (position, attitude, trajectory-control), essentially a remote control system to be used in suborbital and control which reportedly achieves unusually high performance.

From a long range point of view, one of Marquardt's most interesting projects is its Martin rocket which would be able to operate in air's atmosphere. The company has already done tests, Marquardt said, with rocket engines using fuels that actually release heat when combined with nitrogen. Marquardt also is carrying out studies on advanced propulsive systems based on liquid nitrogen, and on the production of electrical power from solar and nuclear energy sources.

Highly Promising

Many of these projects are considered highly promising, but they all require time to reach the proof side of the ledger and money in short and long, much more. Marquardt has Roy Marquardt wants to see the company keep its corporate identity, bring its products to market and diversify through in-house developments and acquisition. But Marquardt has been skeptical and a number of directors to move to, and other wealthy companies have been pursuing Marquardt with attractive acquisition proposals.

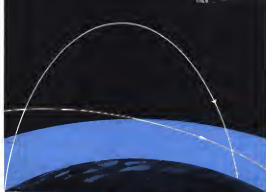
General Electric and United Aircraft



Rocketdyne Facility Will Test F-1 Turbopumps

Stand at North American's Rocketdyne Propulsion Field Laboratory, Corona Park, Calif., will test turbopumps of National Aeronautics and Space Administration's F-1 first stage. In the background, two 26,000-gal. liquid oxygen tanks, a 35,000-gal. fuel tank and a 30,000-gal. water tank have been installed on the stand above. Gas generators extend to dorsal support through above plots of left, shown, and are guided by observation on top of exhaust pipes. Turbopumps, to be tested here this year, will deliver 6,000 lb of propellant a second into the F-1 combustion chamber. Below, a 15-in. liquid oxygen vent is being moved to the test stand.





Ballistic and boost-glide flight paths

These flight paths, arising through space and re-entering the atmosphere, are characteristic of the paths of a ballistic missile and a boost-glide vehicle. In both cases, Boeing holds major contract responsibilities. Boeing is weapon systems integrator for the solid-fuel ICBM, Minuteman, and as part of a TEAM MANA research program, is developing Dyno-Sort to study the problems of sustained space flight. The Dyno-Sort vehicle will be capable of re-entering the atmosphere and making a normal controlled landing.

Boeing scientists and engineers, in addition, are advancing the state of the art in many areas: advanced military and commercial aircraft, hypersonic flight, space crew environments, vertical and short take-off and landing aircraft, gas turbine engines, non-invasive surface systems, among others.

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iod's Plant & Wharfedale Division were the first groups to express an interest in acquiring the Mississippi Corp. Last year Thatch engaged in merger negotiations with the company. At that time Mississippi was in the rather unusual position of being able to give Thatch two things at very much wanted—Kas Mississippi itself, with the experience and qualifications to succeed Thatch President J. W. Cruise, who wants to retire; and a growing nuclear population capable of

Mein Arbeitsplatz

Negotiators finally were called in with an official explanation that the two companies couldn't agree on terms of the stock exchange. However, although neither group will officially comment on the matter now, the real reason for the break in negotiations is believed to have been Ray Marquardt's announcement an taking several of his top people along with him into Thailand to merge meat subsidies, already filled with young executives.

The company most recently reported is showing an arrow, though not yet direct, interest in acquiring Macquarie. One of Lockheed's aircraft

Lothbender's planning department, according to informed industry sources, has been engaged in carrying out a study on Maryland.

New Offerings

The Garret Corp., Los Angeles, Calif., engaged in the construction of aircraft and made component systems. Offering is 100,000 shares of common stock for public sale at \$45.00 per share. Of the proceeds, substantially all will be used to reduce the current bank borrowings.

Infante Industries, Inc., William Voss, engaged in the manufacturing and sale of molded plastics for automotive and other products, has advised the court under provisions of the U.S. Bankruptcy Code that it has received \$135,000 in cash from the sale of its public stock, the offering price and underwriting costs to be paid by shareholders, of the shares, 100,000 to be offered for the account of the company and 35,000 to the holder thereof. Of the proceeds approximately \$420,000 will be applied to the discharge of liabilities of the company and that of a subsidiary, the balance for working capital and other purposes.

Yankee Electric Corp., New York, N. Y., principally engaged in the development, design, construction and sale of aluminum primary and rechargeable batteries under the trademark, Silverox and of silver-zinc oxide rechargeable batteries under the trademark, Silver Ox. It has a 254,000 production capacity.

common stock, for public sale by the holder thereof, offering price and underwriting terms to be supplied by underwriter.

Asbestos Investing Corp., Washington, D.C., a closed-end, nondiversified investment management company, provides equity capital and long-term loans to small business concerns engaged in research, development, scientific applications and manufacture of chemical and other products or devices used in the general field of asbestos and asbestos. Offering is 400,000 shares of capital stock for public sale at \$10.00 per share. Proceeds will be used for its investment in small business concerns in amounts up to \$500,000 for a single concern.

Venue Associates, Palo Alto, Calif., has fixed a price of \$49 per share for its proposed offering of 216,645 shares of capital stock for subscription by stockholders of record July 24, 1960, at the rate of one new share for each 15 shares then held.

Ametek, Inc., New York, N. Y., is composed under New York law of, since 1968, to acquire all of the outstanding stock of SST Co., Inc., and DuPont Electronics Corp., and to engage in the business of distributing, manufacturing and special purpose electronic tubes, flight instruments, electronic components, precision ball bearings and certain aircraft instruments. The assets of the two companies, the electronic materials and solid-state technology, DuPont is the exclusive manufacturing source and supply agency for receiving tubes and electron tubes for the U.S. military and space programs. DuPont's Marketable is 100,000 shares of common stock for public sale at \$4.00 per share. Of the proceeds, \$41,100 will be used to pay the fair value of the 100,000 shares of common stock. The \$17,700 shares of SST common stock to be acquired from Rance Barnett; \$11,000 to repay a loan from Morris Kay, a director and principal stockholder, and \$5,400 to pay the balance of the debt to DuPont. SST's goal is to relocate the present assets of SST Co., \$10,000 for new stock, \$61,000 will be added to working capital and to be used for expansion.

Aircraft Dynamics International Corp., New York, N. Y., engaged in the selling of aircraft parts, supplies and equipment to major domestic and foreign airlines, foreign governments and aircraft overhaul and maintenance facilities. Offering is 95,000 shares of common stock for public sale at \$5.00 per share; this is the first public offering of common stock. Proceeds will be used to expand inventory and to eliminate a working capital deficit.



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David A. Wolfe, Ph.D., is professor of psychology at the University of North Carolina at Chapel Hill.

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BUSINESS FLYING

Time-Lease Firms Spur Business Travel

By Herbert J. Coleman

Nationwide utilization of two-engine business aircraft leased to corporations on a guaranteed time basis is being spurred by two new companies which will supply aircraft, pilots and services.

The firms are Air Time Leasing Division of Aero-Industries, Inc., at Miami, Fla., and Private Air Travel, Inc., at Kiss, Fla. Air Time Leasing has

seven aircraft and 17 on order and Private Air Travel currently is searching out opportunities on potential contracts before purchasing "up to 100 planes." Air Time Leasing Division now concentrates its operations in the South, but plans national operations in another year. Private Air Travel initially will operate in the southeast portion of the U. S., then gradually expand throughout the country.

The Miami firm is the newest operation in the Aero-Industries complex, headed by Alexander Senger and which includes Douglas Aircraft Co. Engineering Co., engine manufacturers, Atlantic Aviation Corp., which makes aircraft and engine components at Raytheon, Fla., Montgomery Enterprises, operator of the Palm Beach, Fla., airport, and Penn America, a scheduled airline.

At Miami, Air Time Leasing now has two Aero Commander, one Piper Apache and two Cessna 441s. In addition, it has an Aero Commander 500B and an Commander 500B on order.

Mrs. Laura G. Steward, director of sales, and the company currently has signed five firms, including a contractor and the other a manufacturer. She said Air Time Leasing also intends to run a lease-bill operation, in which it will purchase a company's air fleet and lease it back on a guaranteed time basis, factoring the view and services.

Eventually, Mrs. Steward believes, Air Time Leasing will be fairly active in the aircraft leasing field through acquisition of business fleets and has tried a run to investigate this field.

Florida Concentration

The company, she said, plans to concentrate operations in the Florida area for the next few months at an office expanding nationwide. There is considerable interest, Mrs. Steward added, in flights in the Caribbean area. One client, Bluehead Machinery, has signed up two Cessna 441s and two Piper Apache planes for trips primarily to the Florida area.

Air Time Leasing handles the plane, pilot, maintenance and insurance in the contracting firm as well as Private Air Travel, Inc. Both companies will supply dispatching services. Eventually, Mrs. Steward estimated, Air Time Leasing will add helicopters and larger transports to its fleet. At the moment, the helicopter type decision has not been made, but Mrs. Steward envisions Douglas DG-53 and Lockheed L-440s as the class of "light transports."

At Kiss, the national operation, Mrs. Steward, who conceived the Air Time Leasing idea and sold it to Aero-Industries, a survey now is under way on potential lease. The company, which has had one public sale, is expected to "go over" of \$1 million, according to Mrs. Steward.

Air Time Leasing is talking to charter business "in the moment," but is concentrating its sales efforts on companies making from one to five years. Roughly,

up, Aero Commander will cost about \$187 per hour on a 200-hr. guaranteed time year's contract, she explained.

Mrs. Steward said Air Time Leasing will add another plane to its fleet for each 600 hr. of time sold to clients. The company is quoted in offices listed from American Aerospace at Miami International Airport. General manager is L. Clark Boush, and Charles J. Ross is director of operations. Company now is having additional flight and ground personnel.

Private Air Travel, Inc., is based at Fort Lauderdale Airport and is headed by Earl E. Krasner, who assigned as manager of General Electric's Transportation Division after 14 years of service in the field of military and surface transport companies.

Krasner has been negotiating with Beech, Cessna, Piper and Mooney aircraft companies on contracts for an initial Private Air Travel order that could run as high as 100 airplanes.

In effect, Private Air Travel is offering a complimentary foodservice type service consisting, as Krasner put it, "the most careful plane with pilots having abundant sailing around." He said that about \$200 public service, only about 600 have scheduled service. The company has applied for an FAA permit to operate as a taxi service.

No Stock

Organization of Private Air Travel, Inc., is the culmination of an idea that was about 12 years in gestation. Associated with Krasner are R. H. Palawa, vice president and national sales manager, and David Gilford, legal counsel. Company has no stock offering on the open market.

Private Air Travel currently is setting up an operation in the southeast section of the U. S., gathering letters of interest to use the service from various corporations. Krasner said the results so far, which include no money transactions, are "most encouraging."

The company will start service when contracts signed within a 300 mi. radius of a designated airport permit the leasing of five airplanes. Each company will have its own dispatching service and Private Air Travel is hiring its own pilots, who must have ATP and instrument ratings.

In addition, Krasner said, Private Air Travel plans to buy some single engine planes both at the Mooney and Beechcraft for the so-called "holdie pilot" who wants to contract for a level time but at least per year. Company plans also can be flown by fully qualified pilots on the common basis, and left at discretion, with Private Air Travel picking the plane up or returning it from that airport.

Krasner cites three advantages to

Civilian Aircraft, Engines Shipments

May 1960

Item	May 1960	Comparative totals Jan.-May 1960
Complete aircraft, total airframe weight	1,090 lb.	5,150 P
By weight of plane:		
Under 3,000 lb. airframe weight	797 P	4,652 P
3,000 lb. airframe weight and over	293 P	6,997 P
By number of planes:		
1- and 2-place	214 P	2,716 P
3- and 5-place	41 P	6,272 P
Over 5-place	41 P	6,272 P
By total rated horsepower, all engines:		
Under 300 hp	41 P	5,193 P
300-499 hp	41 P	6,272 P
500 hp. and over	41 P	6,272 P
Aircraft engines		
Reciprocating	797 P	5,150 P
Jet turbine	293 P	6,997 P
Aircraft engines, total horsepower		
Reciprocating	1,090 P	5,150 P
Jet turbine	41 P	6,272 P
Complete aircraft		
By weight of plane:		
Under 3,000 lb. airframe weight	797 P	4,652 P
3,000 lb. airframe weight and over	293 P	6,997 P
By number of planes:		
1- and 2-place	214 P	2,716 P
3- and 5-place	41 P	6,272 P
Over 5-place	41 P	6,272 P
By total rated horsepower, all engines:		
Under 300 hp	41 P	5,193 P
300-499 hp	41 P	6,272 P
500 hp. and over	41 P	6,272 P
Value of shipments of complete aircraft and parts, total	\$1,090	5,150 P
Aircraft, total		
Under 3,000 lb. airframe weight	797 P	4,652 P
3,000 lb. airframe weight and over	293 P	6,997 P
Aircraft parts		
Under 3,000 lb. airframe weight	797 P	4,652 P
3,000 lb. airframe weight and over	293 P	6,997 P
Value of shipments of aircraft engines and parts, total		
Aircraft engines		
Reciprocating	797 P	5,150 P
Jet turbine	293 P	6,997 P
Engines parts		
Under 3,000 lb. airframe weight	797 P	4,652 P
3,000 lb. airframe weight and over	293 P	6,997 P

* Revised.

† Estimated to avoid disclosing figures for individual companies.

Source: Bureau of the Census, Industry Division



Umbaugh-18 Flies With New V-Tail

Fast flight photo of the Umbaugh-18 suggests close configuration with new V-tail installed, which company says adds to stability and handling performance at Fairchild Engine & Airplane Corp.'s Hagerstown plant (AFR June 27, p. 16). Previous plane flew with two-engine single vertical fin tail, and Bellanca type and tail. Previous plane flew at not yet authorized, new V-tail made new V-tail made new V-tail.



WING TIPS



DON'T BE A CLOUD BOMBER. Flying too close to Old Man Cloud is inviting mid-air collision. If another plane breaks through the clouds, chances are the pilot won't see you in time. Stay in mind that the legal "boom-on-top" means just very little leeway — particularly in jet territory.



TAKE 8. Although checking lights before night flights is good, many pilots fail to take the 8 seconds necessary to check their tail light. Running into old friends is fine, but not while flying. So take 8 — and stay alive.



YOUR BEST AVIATION DEALER. This is the man who's always ready to help anyone start flying today. He knows a complete line of dependable Esso Turb and Jet fuels and lubricants that work hard for your engine "upstairs" when it wants. He can also provide you with Flight Calculators and Flight

Time Sequence Cards — free, of course — to make your cross-country trips easier and more fun. And remember, your Esso Credit Card is a convenient way to charge fuel, oil, lubricants, minor repairs, and landing fees at selected airports from coast to coast, and Canada too.

Highways or Skyways... "ESSO RESEARCH works wonders with oil"

potential time-hour reduction.
 • Nitroside engine first available on oil.
 • Full consultation by certified dis-patching service.
 • All planes in the fleet available to all customers.
 • Major cost reduction due to its revised annual hours per plane, less hover time, reduction in deadheading, pilot rest by various companies to increase seat occupancy, standardization of equipment, and volume questions.
 • Keros breaks down the yearly fixed cost of a privately owned plane this way: 2.8% interest, 6.5% depreciation, 2% insurance, 2% operations and dispatching, 1% hangar and 4.5% pilot's salary, for a total of 15.5% of the cost of the airplane.

Time Charges

On the other hand, out to the Private Air Travel conference is 4.5% of the total cost of the plane, since the company has all the above fixed charges. In general, Keros and a contractor would pay about \$90 per hour for a Cessna 190, based on a 280 hr yearly utilization rate.

A typical contract works this way: The company signs up for a specific make and model of airplane, tailored to his needs, a number of annual flight hours, prepayment a part of the fixed yearly-year amount, and makes weekly payments covering fixed charges and hourly usage.

Outgoing fees of this arrangement is the geographic payment, which Keros adds to as a "traveler deposit," less than the annual amount rate on cost of an airplane. This money comes to Private Air Travel as income, and will be used in financing of aircraft purchases, thus alleviating the need for the company to go outside for capital.

Keros and the partnership agreement involves



Miller Unveils 12E Executive Version

Three-phase Miller 12E helicopter, flown by test pilot Bruce Jones, suitable on two antenna stop a 112-ft. tower at Stanford University's Radiation Laboratory. The antenna on four slanted antennas into place after they were lowered by the 12E. Antenna will be used to receive signals because of the atmosphere from a station 1,800 mi. away. Below is the new Miller 12E executive helicopter, a low price version of the 12E, powered by a 160 hp. Lycoming engine. Stanley Miller and first delivery will be made this fall. Owners of 12Es can choose a lot to modify the aircraft to executive configuration. 12E prototype price a \$49,900.



- Insurance that customers are contracting with a financially sound company, able to expand its engine fleet as rapidly as customer commitments are secured.
- The propulsive payment is a contract "expense" item and not a capital investment.
- Propulsive money can be recovered after a year on a pay rate basis, even

tended to pay monthly costs or, in the fifth year, applied to contract renewal, or refunded in cash, all at the customer's option.

Company contracts that require financing from the outside would require a substantial return on investment, with constant contracted stock or equity sales to expand the fleet. Korman refers to the propulsive agreement as "a model"

amount of pump pricing," in which the customer receives a major return of those funds through lease and money savings, and convenient air travel service.

To stimulate national interest, Private Air Travel is offering dealer and distributor opportunities to expand their existing leased aircraft sales commissions clause. The program involves no distributor or dealer equity in the company, and no price responsibility for operations.

Distributor Gains

They will gain, according to Korman, three advantages:

- Commission on airplanes purchased by Private Air Travel to fulfill contracts negotiated with customers in the dealer's territory.
- Fees for aircraft servicing and hangaring in connection with Private Air Travel.
- Three per cent of the gross monthly revenue realized from Private Air Travel customers who have contracted for that dealer's or distributor's sale of airplane in his territory. This should accrue.

Korman thinks, in an ideal selling arrangement, of dealer distribution and Private Air Travel leases, for mutual benefit.

- Expansion of the dealer's overall base sales, including aircraft sales, leasing, charter, repair, service, cleaning, and flight instruction, due to an expansion of flying by Private Air Travel's program.

Korman emphasized that the Private Air Travel system is not competing with feeder airlines and, in fact, cannot, since the average passenger will cost as a feedliner is about eight cents, against 12 cents for Private Air Travel planes. Disputing critics the point are plans Korman continued, feeder airlines rely upon the lead better will remain high and top costs then shored.

At present, Private Air Travel plans to place about 30 persons who now are in the field selling on competitors to sell the plan and gain firm commitments. Eventually, Korman said, Private Air Travel will have up to 150 pilots.

Lightweight Spray System Developed for Bell 47Gs

Aerospace Aviation Engineering Co., Santa Clara, Calif., has developed a new lightweight spray system for Bell 47C-2 helicopters. System involves a spray boom installed aft and below the cabin which creates a field of 120 gal and was made at Pittsburgh-based spray man, Boscawen Engineering Co. "Carpenter" spray control valve with a built-in separator system to its bypass port which controls an immediate negative pressure on the spray, cutting the spray flow at the end of each spray run.



FAST PROTOTYPE Utva 56 Yugoslavian multi-purpose airplane. We off the grass strip at Vukovar, Niška Airport to begin impressive demonstration. These showed excellent maneuverability and instability of low-speed end of its wide performance range.

Yugoslavian STOL Utva 56 in Production

By David A. Anderson

Vukovar—Fast Western appearance of the multi-purpose Yugoslavian Utva 56 at the Eighth International Aeronautical Display here heralded its entry as a competitor with U. S. and European airplanes in the STOL field.

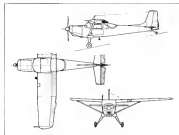
Comparable in dimensions, layout and performance to such designs as the German Dornier Do 27, Czech Bratko 11 or U. S. Heli-Couster, the Yugoslavian plane impressed technical observers with its outstanding flight performance and excellent maneuverability.

The aircraft demonstrated at Vukovar's St. Nikola Airport was flown by Peter Mijakovic and was the first prototype. Design of the Utva 56 was done by Bratko Mijakovic and Dragoslav Petrovic, both engineers of the Federal Aeronautics Office at Belgrade, Yugoslavia.

First production run of the Utva 56 now under way with an initial order for 10 airplanes. Export price and conditions are not yet available, but construction representative, Airway's, the plane can be powered with a Czech-built Praga D6B engine, probably chosen as a gesture toward the Russian-dominated Eastern bloc aircraft industry.

Under the powerplant for the aircraft demonstrated here was a Licamotor GO 415-C282 engine driving a Hartzell constant speed propeller.

Major structural feature in the use of winged aircraft with deflected flaps to give a full span flap effect on the wing. At maximum flap deflection of 55 deg, airflows drop through 15



THREE-VIEW drawing of Utva 56 shows conventional layout and substantially glowing performance. Dimensions at display were suggested by the high quality of wind-tunnel data on the first prototype and the attention paid by its designers and constructors to detail. Wingspan is 35.4 ft, over-all length is 27.2 ft and overall height 5.5 ft.

Utva 56 Specifications

Wingspan, ft.	37.4
Overall length, ft.	27.2
Overall height, ft.	5.5
Wing area, sq ft.	190.9
Takeoff weight lb.	2,050
Maximum speed, mph.	150
Stalling speed, mph.	49.7
Climbing speed, mph.	112.143
Rate of climb, ft/min.	1,140
Takeoff distance, ft.	515*
Landing distance, ft.	1,315*
50% ft. range, min.	172
Maximum ceiling, ft.	16,000

* Over 40 ft. (15 meters) obstacle

Aircraft, Parts Exports

April 1968

Item	April 1968		Cumulative totals January-April 1968	
	Number	Value (\$1,000)	Number	Value (\$1,000)
Aircraft, parts, and accessories, total		153,319		604,733
Commercial and civilian aircraft, total	280	54,492	719	156,746
Aircraft 2,000 lb. and over empty all-time weight				
Boeing transport, commercial, new				
Passenger transport, commercial, new				
5,000-4,750 lb. empty all-time weight	8	712	10	8,384
10,000-16,000 lb. empty all-time weight				
20,000 lb. and over empty all-time weight	9	45,410	36	116,347
Boeing wing aircraft, commercial, new	1	300	0	630
Commercial and civilian aircraft, used and rebuilt, including converted	19	4,331	46	7,383
Aircraft under 2,000 lb. empty all-time weight				
Utility, commercial and civilian, new				
5 place and under	22	343	137	919
4 place and over	110	1,704	349	6,705
Boeing wing, commercial, new	21	767	33	1,324
Commercial and civilian aircraft, used and rebuilt, including converted	42	308	104	376
Commercial and civilian aircraft, new, n.e.c. (all empty all-time weight)				
Alouette helicopters, representing new all-time weight 400 lb.	702	450	608	5,106
Aircraft helicopter, representing used and rebuilt	142	1,422	662	3,618
Aircraft components, parts, and accessories, n.e.c.*		77,390		230,624

Source: Foreign Trade Statistics, Bureau of the Census.

* All-United helicopter engines, new, 400 lb. and over are included in "Aircraft components, parts, and accessories."

* Includes military aircraft.



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to judge the
true speed of
business
aircraft**



You can leave your office in Detroit 8:35 A.M. . . .



board the Gulfstream in downtown Detroit airport . . .



and be in your Washington, D.C., office at 10:35 A.M.

It's door-to-door stepped time that counts. The Gulfstream speed, rate of climb, short field capability, and elimination of waiting periods for history cars, stairways, and other ground-handling equipment drastically reduce door-to-door time. This is the only measure of true speed. And it's these features that enable the extraordinary new corporate take-off — the Gulfstream — to leave many business planes behind.

The Gulfstream can take-off and land on 3,500 foot runways. This means your company can use more than 3,000 airports in the U.S. and Canada . . . to bring you closer to your departure and arrival points. This is part of true speed. The Gulfstream has a well-coordinated access

stairway. Engines start on their own power. You are completely independent of airport ground crew and ground handling equipment. This time-saving is also part of true speed. Add to that the Gulfstream's exceptional rate of climb. And a cruising speed of 550 mph at 25,000 feet . . . and even higher altitudes, in guaranteed comfort. In other words, the Gulfstream delivers optimum door-to-door performance.

How does the Gulfstream performance compare to piston type aircraft and to pure jets? Our distributors will be happy to give you complete information and detailed specifications, and also arrange a practical demonstration of the aircraft.

GRUMMAN

AIRCRAFT ENGINEERING CORPORATION

Bethpage • Long Island • New York



Corporate executives and pilots are invited to inspect the Gulfstream and arrange for demonstration flights through one of the following distributors: Atlantic Aviation, Wilmington, Delaware; Pacific Aviation, Portland, Ore.; Southwest Aviation, Dallas, Texas; Transair Aviation, Ltd., Montreal, Canada.



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- Rotary-positive displacement
- High efficiency
- Surge-free
- Compact

The Heli-Rotor compressor combines in a compact unit the non-surge characteristics of a positive displacement compressor with the high delivery rate of high speed aerodynamic machines. A highly efficient machine with a built-in pressure ratio, the Heli-Rotor has a recommended overhaul time of up to 10,000 hours. Runs from 18 to over 5000 rpm are practical. The effectiveness of the Heli-Rotor has been amply demonstrated in compressing air, nitrogen, hydrogen and refrigerants in aerospace and industrial applications.

The rugged Heli-Kator compressor is so versatile, so efficient, that it may offer the characteristics you need in your own operations.

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STRATOS

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Woods & Marsh, 1800 Rensselaer Avenue
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CLEAR LINES of Ute 35 show to advantage in the high-speed run past observers at the Eighth International Aeronautical Display sponsored at Yverdon's St. Nizans Airport.



REAR PORTION of upper fuselage struts swings upward to give access to large cabin of Tupolev's Uss-16. Multi-purpose plane can handle subsonic loads by removing cabin seats as well as structural, floor or light instrument work.

dog, and can still be operated differently
than for lateral control

Otherwise the airplane is a conventional altered-bayonet, resembling the contemporary in the STOL field. Although guaranteed performance figures given by the company would seem to rule out any claims for STOL performance—for example the landing distance over a 40 ft (15 meter) obstacle is more than 1,100 ft—in the hands of a pilot familiar with the airplane its take-off and landing performance put it squarely in that category.

Large cubes of the Ultra 30 seats last persons, and can be converted to carry freight or stretchers cases by removing the seats. There are two passenger doors, one on each side of

the cabin is the conventional location, and a third new door, which is formed by the raised rear portion of the canopy all of the wing spar. Optional installations include spray-dust equipment.

Standard instrumentation, including instrument flying and navigation aids, is fitted. The aircraft has a landing light and a second light for terrain.

Useful load is just over 1,000 lb. Fuel tanks hold 42 gal. and there is normal baggage allowance and space for 50 lb.



HELL HIDE-1A Helicopter assigned to Army medical units operates on wet ground near a field hospital in Chile.

Bell Helicopters Aid Chileans in Disaster

Ability of Bell HU-1A (Apache helicopter and its Lynxwing TV) helicopter was developed to operate successfully under adverse weather and maintenance conditions was collected during Operation Arango, when the U.S. sent two Army ambulances medical detachments to participate in Chile to assist in disaster relief.

American citizens suffering the same problems have only costly, but available, The Ene NU-1Aa of the 50th Medical Detachment (Helicopter Ambulance) attached to the Army's 15th Field Hospital, Ft. Rucker, N. C., were heavily involved in first aid work, another NU-1A can have the 57th Medical Detachment (Helicopter Ambulance), Ft. Meade, Md., was assigned emergency missions including supporting operations, never trying to show up a day before it could leave. This included fear-driven or death-bid to supply bandages and other medical needs.

Monsoon Weather

The 1984's Eye Ball's Saw 168 catches in approximately two weeks for a total of 192.25 lb., carrying approximately 493 passengers and 77,120 lb. of cargo. The marsters were accomplished during marginal weather approximately 90% of the time.

Habitat: Flying conditions was overcast; blown by Lt. Norman T. Holt, assigned to assist food, clothing and medicines to an isolated area, surrounded by mountains and located on a lake, from which no communication following the earthquake had been with-

Is attempting to land, Lt Elliott and his Chicom at first observe concentrated strong gusty winds. After

These helicopters assigned to the

U. S. Business & Utility Aircraft Shipments

Miyata 20445

[illegible]

By the three-month period January-March this year, 8,999 businesses and selling stands have been defined by the above builders, having a total history selling value of above \$72,354,000. This is an increase of 40% growth and \$8,200,000 over the same three months.

mind of Chiles reported there for one day without maintenance being required, most low clouds, fog, fog and poor visibility. None of the reports was such that a safe automatic was not possible and approximately 40% of the flying was over the ocean. These 3111 As flew a total of 79-45 hr, carrying

out 51 missions and refueling a total of 51,200 lb of material, including building materials, such as corrugated metal sheeting, which was often piled completely to the ceiling roofs. Distances traveled by this detachment is estimated at 77,000 mi.

Observations on the same noted that



Lualaba Demonstrates L-59 Helicopter

Lualaba L-59 four-place helicopter, built around the Miller rotor system, was demonstrated at English International Aviation Display at Yreka, Calif. Noise Aeronautics Inc. of July Helicopters, a development of the earlier L-51 (AW June 25, 1958, p. 57), is powered by a single 240 hp Continental 60-670 D engine. It has 160 hp; visibility from cockpit, giving the pilot an unobstructed view of the terrain during low-level operations. A rotor system (mainly built) adds noise during takeoff to the engine installation. Streamlined shrouds on fuselage legs are tied back. Power which is not used is attached to automatic clutch to ease ground handling of the helicopter, which usually runs at 1,000 rpm. Rotor diameter of the L-59 is 34 ft 6 in., gross weight is 2,077 lb. Maximum speed is approximately 130 mph. Two-bladed rotor is offset, made by French as U.S.

the HU-1A on fuel tank, supplied in 55-gal drums, that was supposed to be JP4, but down the post-flight color and inspection of the fuel tank of the 77A, the fuel is suspected to have been JP4. Fuel was used pumped, and no shutoffs or water separators were available. For these were no accidents or incidents reported during the cruise operations.

Aircraft was flown to Chiles de la Sierra in Douglas C-119 Glushko-ster and landed on the edge of the airstrip immediately after unloading on a rocky and extremely wet ground.

Morane-Saulnier Gets 200 Rallye Orders

Paul-Morane-Saulnier, reports it has orders for close to 200 MS-530 sport airplanes.

The private French aircraft firm reports orders for the three-place, all-metal Rallye (AW June 20, p. 27) have reached that level since the aircraft was first introduced to customers in May. Morane-Saulnier is currently showing its single prototype throughout western Europe.

Morane-Saulnier officials say that 97% of potential customers want the aircraft in trike gear configuration, and 50% are requesting the Continental 140 hp O-300 engine.

Rallye is offered in 90 hp, 108 hp and 147 hp versions. Price ranges from \$5,000 for the 90 hp version to \$6,300 for the 147 hp model.

The 145 hp version, called the Rallye-Supérieur, can be operated at a cost of 1.62 cents per gallon of fuel. This figure includes maintenance and is based on 100 flight hours annually. Cruising speed is 110 mi with the 145 hp engine.

PRIVATE LINES

First Bell 47-2 Ranger helicopter for Alaska was delivered to Anchorage Helicopters Service, Inc., for commercial charter work. Aircraft was ferried from the factory in Hunt, Tex., arriving the week there 8:30 a.m. in 46.5 flight hours, less three elapsed time. Flying at an average speed of 90 mph, the 47-2 Ranger averaged 16.5 gal. of fuel per hour.

Howard Aero 700 executive transport will undergo extensive testing of wings and tail to meet Federal Aviation Agency certification requirements, says Charles Vaughn, Aero's vice president. The aircraft is being modified by the company's design and development department. The aircraft is being modified by the company's design and development department. The aircraft is being modified by the company's design and development department.

Following is a report to Minister of Area, Canadian Study from P. G. Young, chief inspector of accidents, on various causes involving the crash of a British Aerospace 312 (AW June 25, 1958, p. 57) at British Overseas Airways Corp., on a test flight over the Pacific, Chatham, Dec. 24, 1958. Called from Capt. J. E. Jackson, the joint Executive Officer of the Woodhouse, and areas BOAC employee, the first officer and two engineers were reported.

Notification was by telephone from Southern Air Traffic Control Center at 1245 hr on Dec. 24, 1958. The cause of the accident was stated the same day.

The aircraft was making a test flight in accordance with the revised air traffic rules of New Zealand. It took off from London Airport at 1110 hr and was doing the training climb at an altitude of about 10,000 ft. The captain noted the engine trouble and at 1110 hr he requested permission to descend from 12,000 to 1,000 ft. About three minutes after the announcement of the descent the aircraft struck ground, which was obscured by fog.

The aircraft was constructed by Bristol Aero Ltd. in 1957 and last received a Certificate of Airworthiness on Dec. 3, 1957. It was delivered to BOAC on Dec. 5, 1957, and thereafter was maintained by the company in approved maintenance schedule. On Dec. 5, 1958, the Certificate of Airworthiness was renewed for a further year prior to the last flight the aircraft had flown a total of 1,512 hr.

A check-up inspection in conjunction with Group D of the progressive overhaul program was carried out on the aircraft between Dec. 14 and Dec. 21, 1958. Part of this work involved the calibration of the pitot altimeter, speed indicator and rate of climb indicator. The results were certified as acceptable for the last flight. The weight and load distribution was within the permitted limits.

The Crew

Capt. J. E. Jackson, aged 46 years, was a senior captain and had the officer in charge of training for Engineers 312 aircraft in BOAC. He held a valid pilot license and was a valid pilot license in group 1. He was between 100 and 100 years old. This is a record of the aircraft and its crew. The aircraft was a record of the aircraft and its crew. The aircraft was a record of the aircraft and its crew.

There was extensive fog at 1,000 ft and the aircraft was a record of the aircraft and its crew. The aircraft was a record of the aircraft and its crew. The aircraft was a record of the aircraft and its crew.

SAFETY

British Accident Investigation Report:

Pilots Misread Altimeters in BOAC Crash

Following is a report to Minister of Area, Canadian Study from P. G. Young, chief inspector of accidents, on various causes involving the crash of a British Aerospace 312 (AW June 25, 1958, p. 57) at British Overseas Airways Corp., on a test flight over the Pacific, Chatham, Dec. 24, 1958. Called from Capt. J. E. Jackson, the joint Executive Officer of the Woodhouse, and areas BOAC employee, the first officer and two engineers were reported.

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The Weather

The weather forecast for the area of the flight for the period 1000 hr to 1030 hr gave attention to extreme state of fog, especially in the west and north, to 11 ft in the south. The forecast was based on the state of the air and prevailing wind. The height of the base of the clouds was given as 1,000 ft, to 2,000 ft, with tops at 10,000 ft. Visual observations of altitudes and heights were based on heights of less than 10,000 ft. The weather was reported as "Marginal" and the weather conditions in the area London-Edinburgh between 1000 and 1030 hr is as follows:

General. About the whole of England was in a red sea and the resulting poor visibility was almost universal. Wind was from the west, light and variable, 2,000 ft. to 4,000 ft. Visibility was 1,000 ft. to 2,000 ft. The weather was reported as "Marginal" and the weather conditions in the area London-Edinburgh between 1000 and 1030 hr is as follows:

There was extensive fog at 1,000 ft and the aircraft was a record of the aircraft and its crew. The aircraft was a record of the aircraft and its crew. The aircraft was a record of the aircraft and its crew.

by the fog and low stratus. However, very little cloud would have been seen at 10,000 ft.

Visibility was generally 300-500 yards below 100 ft, with slight improvement at 1,000 ft and 3,500 ft. The ground was not seen at the top of the fog. Planning level was 4,000-4,500 ft. Airframe weight and balance were within limits.

Note: In the vicinity of Chatham there would be complete coverage of fog and low stratus with tops about 1,500 ft. (There is little to have been seen at 10,000 ft. altitudes) types cloud about 10,000 to 12,000 ft.

The Flight

The aircraft took off from London Airport as a scheduled flight at 1110 hr on Dec. 24 for a test flight in accordance with the revised air traffic rules of New Zealand. The captain was at the controls in the left-hand seat and the first officer in the right-hand seat. The aircraft was reported to be in the air at 1110 hr and was also reported to be in the air at 1110 hr.

Engineer Officer Woodhouse reported the jump seat, between and slightly to the rear of the pilot, Engineer Officer Jackson was at the rear of the aircraft and the Engineer Officer O'Keefe was at the rear of the aircraft. The three engines started as a team but Engineer Officer O'Keefe was apparently responsible for the engine's operation. The three engines started as a team but Engineer Officer O'Keefe was apparently responsible for the engine's operation. The three engines started as a team but Engineer Officer O'Keefe was apparently responsible for the engine's operation.

During the climb the crew checked that both pilots' altimeter readings read 1,000 ft. The first officer's altimeter was checked by the second officer's altimeter. The first officer's altimeter was checked by the second officer's altimeter. The first officer's altimeter was checked by the second officer's altimeter. The first officer's altimeter was checked by the second officer's altimeter.

The first officer was stated that he was asked to confirm to the pilot the present reading of the altimeter. The first officer was stated that he was asked to confirm to the pilot the present reading of the altimeter. The first officer was stated that he was asked to confirm to the pilot the present reading of the altimeter. The first officer was stated that he was asked to confirm to the pilot the present reading of the altimeter.

COMPRESSION to 12,000 psi ...discharge capacities to 150 scfm

with
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AIRCRAFT SYSTEM



See Technical
Data and
Operating
Instructions

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10000 W. 10th Ave., Denver, CO 80231

WHO'S WHERE

(Continued from page 21)

Changes

James V. Feltz, Jr., assistant general manager, Instrument Division of Lear, Inc., Grand Rapids, Mich.
Charles S. Wright, assistant general manager, Lockheed's Design Division, Marietta, Ga.

Donald E. Adams, director of system engineering, The Radio Systems Division, Cook Electric Co., Franklin Park, Ill. Also Col. E. T. Bollock (USA, ret.), director of systems.

Harold C. Harris, technical manager, systems Engineering and Management Operations of Systems Electronics Systems, New York, Mass., a division of Systems Electronics Products, Inc.

Dr. Frank Greenlee, Dr. Vincent J. Benoit, and Dr. John M. Wabary have joined the staff of Washington Electronics Corp., 4400 Adelphi Road, Washington, D.C.

Ed Woodhouse, laboratory director of National Aeronautics, Inc., Pasadena, Calif.

Clifford A. Murray, manager of the newly formed Computer Products Department, Lewis Co. Division of Union Carbide Corp., New York, N.Y. Other appointees: **Dr. B. J. Shickel**, Jr., sales manager; **R. L. Thompson**, manager of engineering and development; **E. L. McCandless**, senior technical director.

Robert P. Norton, department manager of Basic Automation Area Division, American Bosch Air Corp., Camden, N.J., and **William E. King**, department manager of field service.



Cessna Dealer Expands on West Coast

Aerovis, Inc., a new Cessna distributor under Aerfile, Inc., West Coast distributor for Cessna, will occupy this \$750,000 freestanding and private plane facility scheduled for completion in mid-October at Van Nuys, Calif. Construction includes 23,000 sq ft. of hangar space, 15,000 sq ft. of office space, 25,000 sq ft. of storage area and 14 acres of paved ramp area. It will be a 100-foot entrance area fully equipped with propulsion and visual display aids for use by corporate aircraft customers desiring to hold meetings at the airport on their day-long sales tours. Other building's first floor will have a 4,000 sq ft. showroom capable of handling five planes up to 120 tons. Newly acquired Aerovis, Inc. is headed by Percy C. Bosley, lead estate broker and formerly in the sales and grocery business.

William F. Rouse, special consultant to the vice president for government activities, vice president of General Instrument Laboratory, Inc., Buffalo, N.Y.

W. E. Gibson, chief of the study in general Guidance and Control Division, California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.

Myrna A. Tapp, manager of mission systems, Washington, D.C., for The Garrett Corp.

Thomas C. Means, customer relations director, Composites Division, Fiberglass Corp., South Ave., Calif., a subsidiary of Owens Scientific Corp.; and **Joan J. Gray**, sales manager.

Dr. A. Victor Stern, manager of the newly established systems laboratory, Hughes Aircraft Co.'s General Systems Group, Culver City, Calif.

A. M. (Ted) Johnson, assistant program manager for design and test-Delta-Star manned space plane, Boeing Airplane Co., Seattle, Wash.

Daniel F. Shaw, general manager, General Electric Co.'s Aircraft Nuclear Propulsion Department, Flight Propulsion Division, Cincinnati, Ohio.

Dr. R. F. Pollock, director of Lockheed Aircraft Corp.'s development test team, Burbank, Calif.

Dr. James W. Means, research director of the Space-Rand Research Center in Seattle, Wash.

Col. W. W. Bailey (USAF, ret.), assistant program manager, Communications & Weapons Systems Division of Philips Corp.'s Government & Industrial Corp., Philadelphia, Pa. Also **George Mueller**, manager of manufacturing.

Dr. Arthur Meyer, executive director, Aerodynamics Department, National Engineering Science Co., Pasadena, Calif.



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